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ABSTRACT

This curriculum guide presents a plan to implement an environmental education program. The main objective of the program is to develop environmental literacy including skills of inquiry, problem solving, managing, and communication, knowledge of environmental interrelationships, and positive attitudes and values toward environmental problems and their solutions. The program emphasizes interdisciplinary, student-centered activities. The guide begins by defining environmental education and its philosophy. A plan is outlined to develop the program: recognize a need, sell the idea, establish a committee, set goals, develop a plan, collect information, determine curricular changes, provide inservice education, pilot the project, support program, and evaluate and recycle. Program settings are discussed including the community, state and regional resources, and national sites. The major portion of the guide discusses curricular design encompassing teaching techniques, environmental literacy objectives, and strategies and approaches for curriculum change. Teaching strategies recommended include a single discipline course, multidisciplinary course, minicourses, enrichment, and community action projects. Finally, the guide discusses two approaches to environmental education: interdisciplinary and single disciplinary. Sample class activities are listed for each approach. The appendices are comprehensive listing resources, references, state and federal agencies, and sample units. (MR)

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Environmental Education

a source book for educators

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SOUTH CAROLINA DEPARTMENT OF EDUCATION Cyril B. Busbee, State Superintendent

SE 020 775

ENVIRONMENTAL EDUCATION

A SOURCE BOOK FOR EDUCATORS

A QUESTION OF LIFE

ITS QUALITY
AND
ITS FUTURE

Developed by

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1976

THE MODEL ENVIRONMENTAL EDUCATION PROGRAM

A model environmental education program is one which helps the individual become (1) aware of the environment and its associated problems; (2) concerned, knowledgeable, and accurately informed about the problems; (3) knowledgeable and informed about the possible future consequences of the problems; (4) engaged in clarifying values and making decisions based on attitudes and beliefs; (5) involved in finding the solutions to environmental problems—alternatives, trade offs, compromises, and costs; and (6) committed to and involved in some type of constructive action which enhances environmental quality.

—Jonathan M. Wert, Ph.D.

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PREFACE

During the past decade, research has developed a great many unique ways to project the future. We now have numerous forecasting specialities, all trying to determine what major alternatives may emerge from present situations and what actions may determine which of these alternatives will actually take place. Surely the future of the environment is fundamental to the future of all humanity. And the environmental future can be influenced by present actions over which we have some degree of control.

Education is a key to enhancing our environment and, hopefully, to maintaining it as a legacy to coming generations. Through education students can develop increased awareness of their cultural heritage and the impact that technology, life style and population have on the quantity of natural resources and the quality of life.

The purpose of environmental education goes beyond enhancing our appreciation of nature, beyond changing our life styles to one of less wastefulness, beyond heightening our awareness of pollution, urban blight, loss of precious wetlands, and comparable environmental problems. Environmental education goes further than awareness. It is a major vehicle for problem solving. It is a relevant approach to the development of skills and understanding in many subject areas. It is education for responsible citizenship.

When we forecast the future of environmental education, we foresee hopeful prospects. We envision elementary children using the outdoors as a classroom for increasing their skills through heightened sensory perception and for developing a feeling of unity and interdependence with the natural world. We see high school students engaged in independent studies, work-study programs with city planners, using their problem-solving skills by studying real community problems, or perhaps designing solar energy systems for heating their schools.

The future can include students participating in multidisciplinary classes under the guidance of master teaching teams. It can include opportunities for teachers to acquire new skills for teaching environmental education and for developing awareness of newly identified areas of concern for exploration with their students.

South Carolina has a long heritage of conservation education and conservation efforts. Ours was one of the first states to publish guides, *People and Their Environment,* which were written by teachers for teachers. Many of our schools have added outdoor learning facilities and developed original locally oriented materials. Many more have requested information and guidelines to help them develop their own environmental education program.

For this reason we have gathered information for the district administrators, the school principals and the classroom teachers who would like to become involved in environmental education. We hope that this source book will stimulate educators to a new awareness of man's relationship to his environment and the importance of sound problem-solving and decision-making skills to future citizens. We hope that it will supply schools with the design and impetus to respond to concerns of their community with positive programs that provide the knowledge and skills for a bright tomorrow.

Cyril B. Busbee
State Superintendent of Education

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We are also grateful to the Education Committee of the South Carolina Advisory Council on Environmental Education for assistance in the development of the indicators of environmental literacy.

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INTRODUCTION

Environmental literacy is one of the basic goals for the students of South Carolina. This has been defined to include knowledge concerning the environment and man's relation to it, skills in problem solving, managing and improving the environment, and the attitudes and values necessary to motivate action for environmental quality.

Environmental education is interdisciplinary. It can link subject matter fields and provide meaning for existing curricular material. It can encourage students to investigate their local community environment in an effort to reinforce the subject and provide a working knowledge of the human ecosystem.

The objectives of an environmental education program are the same for any grade level. A rich learning environment should be designed which would include opportunities:

1. for the students to examine phenomena and relationships which constitute their environment and provide insight into the basic principles of the universe
2. to develop the skills of inquiry, problem solving, decision making, computation, and communication through study of specific environmental situations
3. to clarify values and develop attitudes which influence decision making
4. to develop awareness, concern, and responsibility for environmental problems and their solution
5. to develop lifelong leisure time activities that have minimum environmental impact

Environmental education must be activity centered, concentrating on the immediate environment and local resources. For example, what does the environment look like from your school window? What features of the school grounds could be used to help children understand erosion, predator-prey relationships, or producer-consumer relationships?

Environmental education must also be student centered, involving students in choices and providing opportunities for them to become immersed in their environment – to see, hear, feel – and in general, experience themselves as a part of the environment, not just as passive spectators.

Environmental education, by its very nature, crosses subject and grade boundaries, providing many opportunities for team teaching and cooperative planning.

Environmental education should be individualized and lends itself to learning centers and stations both indoors and outdoors. It can involve extensive reading and research or simple studies of the local log community. It extends the walls of the classroom to include the school, the community, the region and the world.

Through environmental education, children:

become aware of the need for intelligent utilization of resources, of the responsibility of individuals and groups for wise social action;

have an opportunity for learning, for growing, for feeling, and for self-discovery in the natural environment with other living things;

can be involved in areas of real concern — concern about the quality of life, about foods that are unsafe to eat, water that is unsafe for swimming, air that is unsafe to breathe, and about the quantity of resources and energy;

learn where their material goods come from and what happens during their transformations;

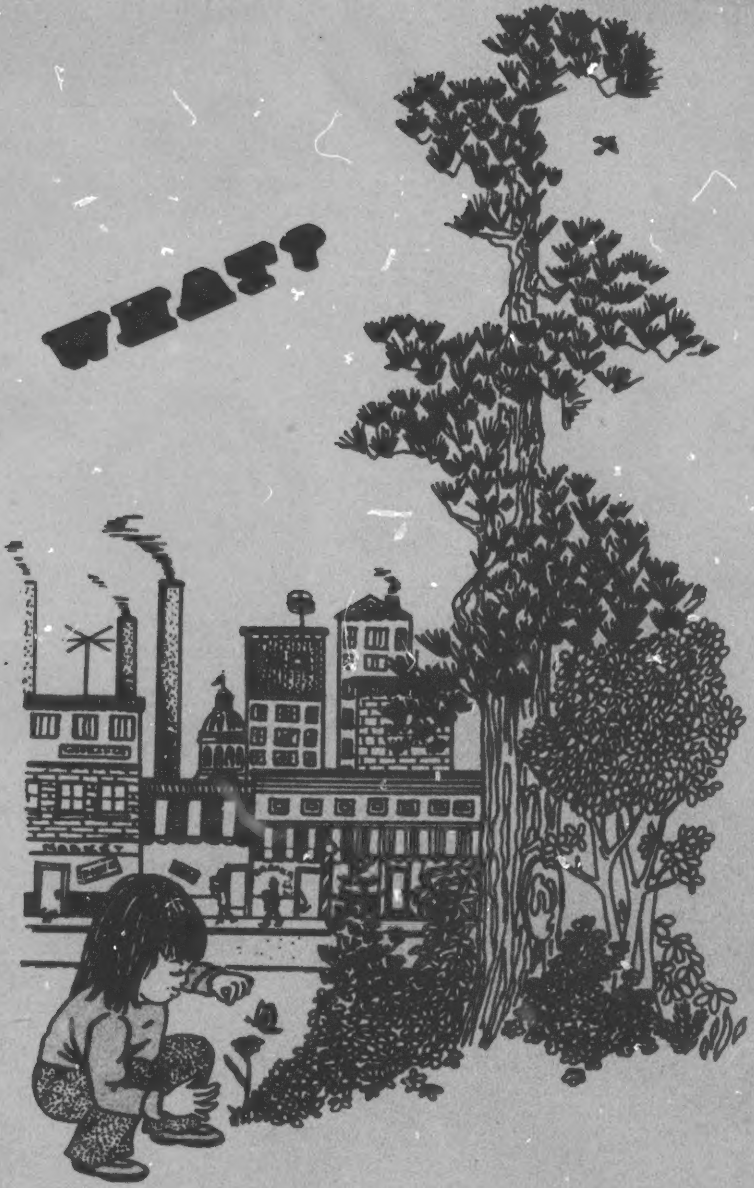
learn how decisions are made, why they are made, and how policies can be changed;

can explore their environment without someone telling them what they are supposed to find — to know their environment intimately and really care about it.

Individuals must realize that they have an impact on the environment. They can enhance it or degrade it. Each individual has a responsibility for stewardship, a responsibility to the future.

Alice Linder
Environmental Education Consultant

WHAT?



WHAT?

The Environmental Education Act of 1970 defines environmental education as:

> an integrated process which deals with man's interrelationship with his natural and man-made surroundings, including the relation of population growth, pollution, resource allocation and depletion, conservation, technology, and urban and rural planning to the total human environment. Environmental education is a study of the factors influencing ecosystems, mental and physical growth, living and working conditions, decaying cities, and population pressures. Environmental education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.

Environmental education is a relatively new term used by educators to describe multidisciplinary curricular innovations which increase understanding and promote a sense of environmental stewardship. Most of these innovations involve:

Knowledge – of basic principles and problems of environmental systems

Skills – in problem solving, decision making, environmental monitoring and socio-political means for management

Motivation – to employ the knowledge and skills necessary to maintain environmental quality for all living things

You may wonder why the former term of Conservation Education was dropped. The following comparison indicates the difference in emphasis resulting from an ever changing world.

CONSERVATION EDUCATION	ENVIRONMENTAL EDUCATION
Separate studies of management of each basic resource such as soil and water	Unified study of human ecosystems
Local emphasis and problem solving	Global interrelatedness of environmental problems such as nuclear testing and ocean fisheries
Primary concern – management and preservation for endangered species	Primary concern – quality of life for human species (emotionally secure and pleasant environments of sufficient variety to allow for choice for homes, work and recreation)
Quality of resources and their management	Quality of human experience
Energy not included	Energy sources, limitations one of the major concerns
Studies of the natural and rural world	Studies of the natural, man-made, rural, suburban, and urban world
Concern with management of nature today (economic expedience)	Concern with a place for humans tomorrow (ensuring survival of a stable world population with more equally distributed resources and global rather than local management) *(reference 36)*

While there is still need for "conservation education," the most pressing problems of our society are problems of the man-made environment — e.g., urban blight, land use, traffic congestion, air and water pollution, energy development, and noise. Therefore, for today's students, environmental education becomes a more realistic and more inclusive program.

Confusion over the terms interdisciplinary and multidisciplinary have led some people to label anything environmental education. While a healthy community may be an aspect of a social studies class, it is not all of social studies. Determining the characteristics of an attractive and unattractive community or building may be an activity in an art class, but it is not all of art.

Environmental education is not just nature study. It is not just conservation and resource management. It is not a new subject that must be added to the current schedule with associated additional funding.

The South Carolina State Department of Education has adopted the following functional definition to direct the plans and programs labeled environmental education:

> Environmental education may be defined as those multidisciplinary processes which help learners perceive and understand environmental principles and problems and enable identification and evaluation of potential alternative solutions, assessing the consequences and resolving the problem. *(reference 12)*

Analysis:

Because environmental education includes some basic knowledge and skills of several disciplines (biology, chemistry, sociology, economics, psychology, arts, etc.), it must be considered multidisciplinary, and the related information and skills used in an integrated manner. Because people must be able to perceive with the senses, and understand with the mind, before making decisions or resolving problems, environmental education must help learners perceive and understand.

Because basic principles determining the structure and function of ecosystems must be understood and problems must be accurately defined before they can be solved, both the principles and problems of the environment become the content of environmental education.

The goal is environmental literacy — the knowledge and ability to identify and evaluate alternatives, objectively determine consequences, then find and take the most beneficial course of action.

WHY?

WHY?

Are you disturbed by increasing costs of energy? Concerned about offshore drilling for oil? Are you plagued by traffic congestion, air and water pollution, and a deteriorating "down town" area? If so, you are probably aware of some of the causes of our discontent.

Consumerism

Is more better? Is growth always good? Examine your way of life. Does it reflect a commitment to the protection and wise management of your life support system – the environment?

Habit of Independence and Excess

Do you contribute to traffic congestion or walk, bicycle or use mass transit? Do you concur with the statement that, "Waste may be wrong, but it's convenient, time saving, clean and money making"?

Economy and Corporations

Look at some advertisements. Do they encourage increased spending? Do they reflect modifications in production for conservation of natural resources, recycling or pollution prevention?

Government

In general, what dominates public decision making–short- or long-range goals, balanced social conditions or short-term economic gains?

As long as our beliefs produce life styles in conflict with maintenance of a healthy environment, we will have increasingly severe environmental problems. At our present rate of use and abuse, the environment will not be able to sustain our civilization much longer. Already we see the writing on the wall in shortages, substitutes, and increased costs. Schools have a responsibility to alert youth to present and emerging environmental problems and the appropriate actions necessary to resolve them. Education can provide the impetus for improving the environment, and an improved environment can provide enhanced learning opportunities.

WHY?

Health	The capacity of the environment to absorb constant abuse has reached a point where continued degradation will markedly affect the quality of life. Waste disposal and misuse of air, land, and water resources are already taking their toll in the health of our population.
Economy	Knowledge and use of the natural systems for filtering our water, maintaining our food supplies, and reducing operating expenses in our buildings are just a few of the ways that education can cut costs.
Freedom	If there are no options, there can be no choices. A variety of environments must be maintained to meet the needs of a diverse population – needs for housing, work, recreation, and learning. Environmental education provides a multitude of learning options as the classroom is extended to include the neighborhood, the community, the state, the nation, and the world.
Emotional Well-being	Humans need to escape the confinement of four walls; they need to feel a sense of oneness with the natural world. They need the informal group interaction of a cooperative effort. These can be supplied in environmental education. Technological advances have tended to cut people off from nature. Pavement has replaced trees, cars have replaced feet, and people rarely see beauty and feel a part of their surroundings.

Democracy	A government "by the people" can be successful only as long as people will participate and make wise decisions "for the people." Environmental education provides opportunities for students to develop decision-making and problem-solving skills and participate in enacting and enforcing environmental legislation.
Future	In 149 B.C., Cicero said, "He plants trees to benefit another generation." Only an effective environmental education program will provide citizens with the awareness and commitment needed to make such decisions today that will enable life to continue in the future.
Relevance	The concerns of the classroom are often completely unrelated to life outside the schoolhouse, and students frequently find the formal environment unrealistic and lacking in meaningful experiences. They fail to make any connection between what is being learned in the school and its usefulness in the real world. In an environmental education program, chemistry takes on new meaning when students are testing their own water supply. World geography takes on new dimension when they relate the locations of the earth's fossil fuels with the countries that are the greatest users.
Cooperation	Being multidisciplinary, the study of a local issue can result in cooperative planning among faculty members, cooperation between community and school, and cooperative planning and work between faculty and students. When people work together on a common goal such as a community nature trail and picnic area on a school campus, better understanding and greater mutual support result.
Motivation	To watch, listen to, and measure real things in the real world (e.g., to contribute data to the city council for their consideration of a polluted water supply), to experience, and to participate is to turn kids on to learning.
Self-image	A healthy self-image, a feeling of individual worth, and ability to contribute to the welfare of the community enhance self-respect.
Social Responsibility	A sense of individual and collective responsibility for the well-being of others, including future generations and the well-being of the total environment, results.

Without the knowledge, skills, and attitudes that result from an effective environmental education program, citizens are apt to contribute more to problems rather than to solutions – problems that are frequently irrevocable and can have deleterious effects on other aspects of the environment for many generations. With our population growth, consumer-oriented economy, and technological power, we are managing to disrupt or destroy natural balances and interrelationships essential to all living things, even people.

Change is continual and inevitable, but people have the power to affect change through their social, political, and economic systems as well as by their technological advances. All of these systems can have short and long-range effects on environmental quality. All must be considered as changes continue to influence life on our planet, our nation, and our State.

South Carolina has a rich environmental heritage which could be lost if citizens do not become informed, aware of their individual and collective responsibilities and willing to make wise decisions and act on them. In our rapidly changing world, indifference can be deadly.

WHY?

Because environmental education can help develop:

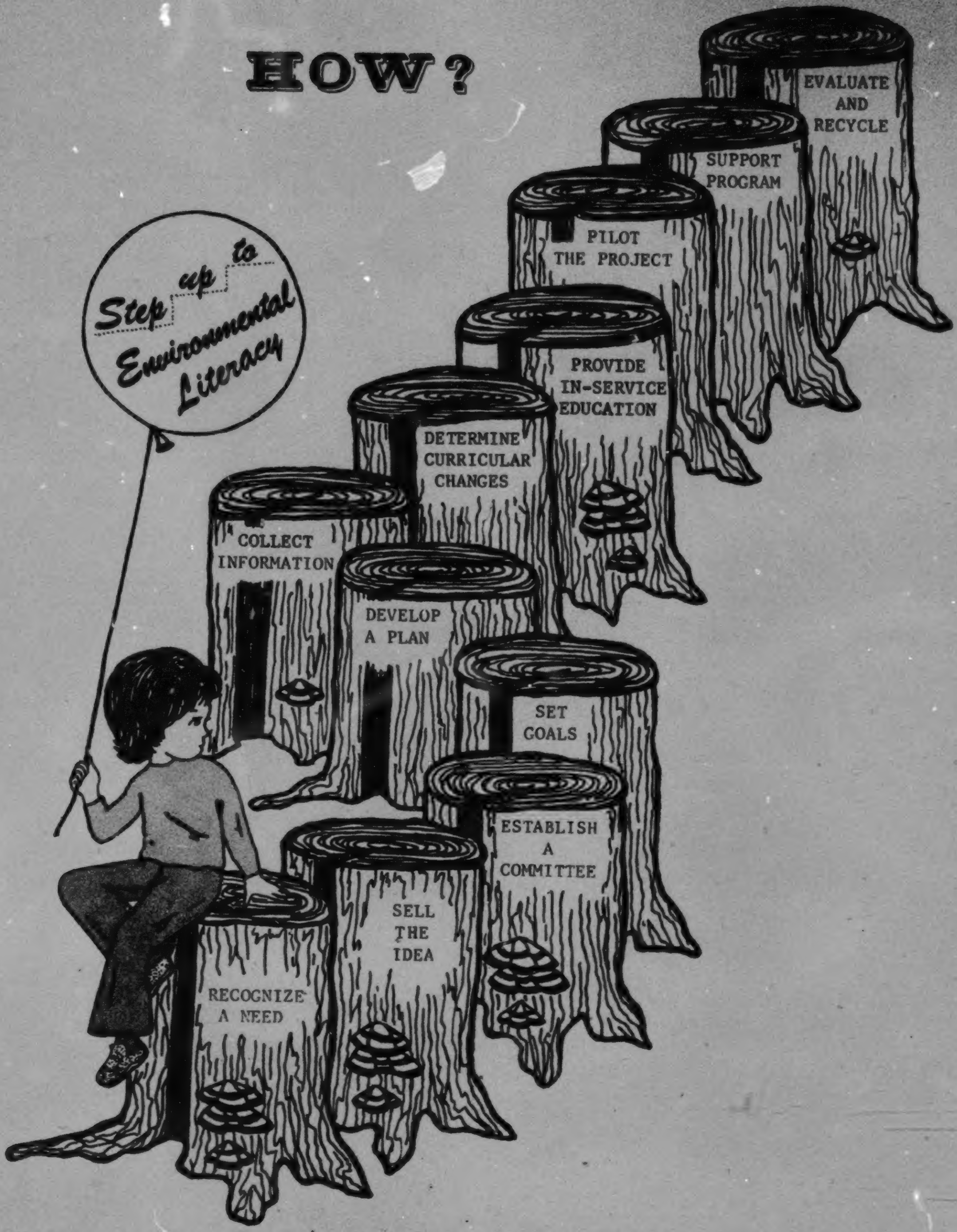
Values	Students analyze and clarify their personal values concerning environmental quality.

Appreciation	Of knowledge and its use in making decisions and solving problems, of beauty and symmetry of the natural world, of the patterns and interrelationships essential for life accompanies environmental experiences.
Social Skills	Cooperation with others in collecting, sharing, and evaluating information, discussion, planning, and decision making, and work on projects develop social skills.
Intellectual Skills	Skills in applying basic concepts to a variety of situations – skills in problem solving, observation, data collection, critical analysis, rational evaluation and skills in inquiry and decision making are developed.
Communication Skills	Students improve effective personal expression of their points of view by discussion, written reports, letters to newspapers and congressmen, communication between students, teachers, parents, and other citizens.
Computational Skills	Measurements build basic math skills.
Interest	Exposure to new things, places, and situations with active involvement stimulates increased or new interests.
Awareness	of relationships to the total environment of finite resources and growing demands of world-wide interdependencies and interrelationships of community structure, function, and problems of future consequences of present actions of the components of interrelationships in an environment through direct examination.

The Environmental Education Act which was signed into law in 1970 was based on the concept that "we as a society can no longer afford the luxury of not knowing the environmental consequences of our decisions." It states: "The citizens of this country, both present and future, must understand the ecosystem and the interrelationships between its parts. Each phase of education, from preschool through adult and continuing education, must be reordered to permit the introduction of ecological understanding."

Your future – it's your decision. It can be based on intelligent decisions based in turn on valid information, or it can be a happening resulting from neglect and indifference.

HOW?


Step up to Environmental Literacy
RECOGNIZE A NEED
SELL THE IDEA
ESTABLISH A COMMITTEE
SET GOALS
DEVELOP A PLAN
COLLECT INFORMATION
DETERMINE CURRICULAR CHANGES
PROVIDE IN-SERVICE EDUCATION
PILOT THE PROJECT
SUPPORT PROGRAM
EVALUATE AND RECYCLE

HOW?

RECOGNIZE A NEED

Environmental literacy is essential to make intelligent value judgments about what kind of life we want and what we are willing to pay for it. Are we willing to pay the price necessary for survival of our progeny, or will we continue our wasteful ways and use up their world and their heritage?

Once your district has recognized the need, you will want to begin activities that will lead to improved environmental literacy among your student population. The first step in planning is recognizing needs. The Advisory Council on Environmental Education has completed an assessment to determine "What should be." Their list of Indicators of Environmental Literacy (see page 47) describes the knowledge and skills that South Carolina students should acquire to achieve this goal. You may use this listing as a guide or set your own standards or criteria of what the environmentally literate student should be able to do.

SELL THE IDEA

It is important to identify and to interest key personnel at each level in the school system, people who are respected leaders. Once these people become involved and experience success with environmental education, others will be willing to try similar activities also. Teachers will be more interested in using educational innovations that motivate students and provide meaningful experiences for teaching basic concepts and skills. There will always be some who climb onto the bandwagon more as a result of social pressure than because of a belief in the benefits of the program. But the energy crisis, pollution, possible radiation from nuclear development, and preservation of beautiful natural and historic areas of our state can carry a tremendous impact.

A public information program is a valuable way to build community support—cooperating with city or county officials, Chamber of Commerce, organizations, clubs, and individuals interested in local and state environmental concerns. It is important to create grass root support from taxpayers and voters.

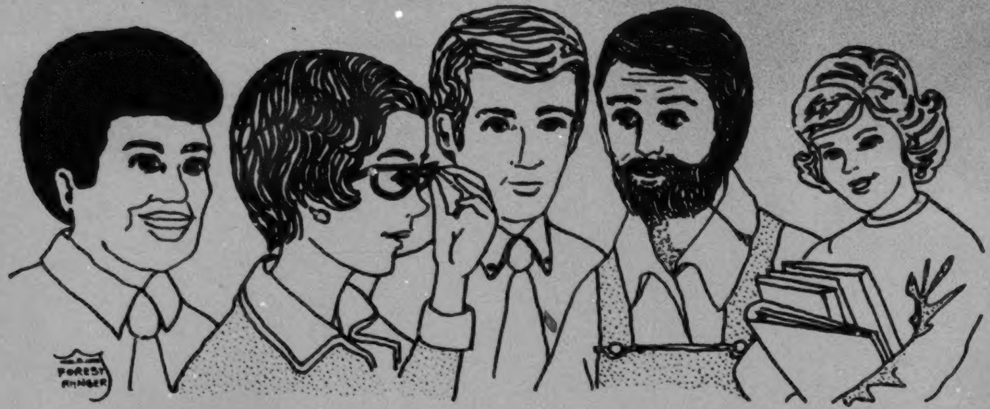
Perhaps the best "salesmen" are your students. Their activities and products often involve the assistance of parents who then proudly share with neighbors and friends.

ESTABLISH A COMMITTEE

The development of an effective environmental education program depends on the approval and support of all segments of the community (students, parents, government and civic organizations, agencies, and educators). Support is most easily obtained by involving people in the planning and implementation of the program. A good committee with a responsible chairman can also relieve the district superintendent and school principals of added administrative responsibilities. Therefore, an advisory or steering committee and a program coordinator should be appointed by the school board.

The committee should be composed of persons who are willing and able to expend the necessary time and effort to provide for the establishment of an environmental education program. It is recommended that the committee include persons representing each of the following categories:

1. School system personnel on all levels—students, faculty, administration
2. PTA organizations
3. Civic groups (garden clubs, Scouts, Jaycees)
4. Local and regional governmental agencies (city hall, county planning council)
5. Resource management organizations and agencies—Wildlife Federation, Soil Conservation Districts
6. Local news media



Sample committee could look like this:

District Program

teachers—Elementary, Middle, High
students—Elementary, Middle, High
principal or assistant
PTA representatives
school board member
civic leaders

Single School Program

teachers
students
principal or assistant
PTA members
school board member
civic leaders
librarian
local resource persons

State agencies can also lend support for your program. The Legislature, colleges and universities, State Department of Education, and resource agencies can be involved in a planning visit. Environmental specialists from the State Department of Education and local colleges and universities may be enlisted as advisors or used to conduct teacher education workshops or summer institutes.

The environmental education committee should establish a regular meeting schedule and form sub-committees for special purposes. Not only is community participation important, but student and teacher involvement is essential. Students should be encouraged to share responsibility through program planning, curriculum design, monitoring environmental quality, independent study projects, and development of outdoor facilities.

In the beginning the committee should seek advice from experienced environmental educators and elect a chairman to coordinate activities. Once organized, the committee may be responsible for several functions:

1. Assess present conditions and needs. Consider the total community as a classroom, including buildings, land adjacent to schools, parks, and other suitable learning sites. The committee for a single school should consider school building structure, school ground, courses of study, interests and needs of students and teachers.
2. Recommend goals, program design, and strategies for achieving goals; implement tasks, schedule, people responsible to carry out tasks, and necessary budget.
3. Conduct a comprehensive community resource inventory, including both facilities and people. This should include key people and organizations, the nature of assistance which they can provide, and suggestions for valuable field trip experiences.
4. Assist in the identification, acquisition, and development of school sites and environmental study areas. This might include planning a creative playground, interpretive trails, or outdoor study areas.
5. Assist in the organization and operation of an environmental education resource center for the school and community. This could include gathering information and instructional materials about the community, such as maps, ordinances, soil studies, photos, etc.

6. Assist in planning, organizing, and implementing teacher in-service workshops. This should include ways of using resources and interdisciplinary environmental learning activities.
7. Assist in identifying community environmental problems and improvement projects in terms of their value for participation by students and teachers.
8. Assist and support the classroom teachers by classroom presentations about town history, land use, etc.; by helping with field trips; by supplying information; by arranging internships for interested students, such as work in water treatment plant, fish hatchery, or sanitation department.
9. Develop a public information program to gain community support and cooperation. This may be done by informing the community about the program and its activities through the press and talks to groups. Key people should be kept informed of progress and outcomes.
10. Identify and reexamine successful environmental education programs in other areas of the state and nation. These programs and materials may be recommended for adoption or adaptation if found suited to the district board's environmental education plan and philosophy.
11. Identify and overcome constraints which will limit the success of the program.
12. Assist in the development of evaluative instruments to determine the effectiveness of the program in achieving its objectives.
13. Generate new ideas, projects, and directions for the program. As new needs are identified and as recent trends and research indicate, modifications should be made in the overall plan.

SET GOALS

Formulation of goals is essential to developing a plan of action. A good statement describes the general conditions to be attained. *(reference 22)* Some guiding principles that may be considered in identifying goals for an environmental education program include:

1. It should be an integral part of the total school curriculum (K–12).
2. It should be interdisciplinary, crossing subject boundaries and grade levels.
3. It should be activity oriented, involving students in firsthand experiences with the phenomena to be studied.
4. It should be student-centered, involving students in planning as well as carrying out plans and utilizing learning centers and stations both indoors and outdoors.
5. It should result in an "environmentally literate" student who is capable of evaluating the effects of individual and collective actions in a rational manner, demonstrating values which reflect a life style in harmony with his environment, and committed to working for constructive action to maintain a healthy environment.

School District Goals

With an overall goal of environmental literacy, a district may select a variety of appropriate sub-goals. Since each school district has its own unique resources and people, its own talented faculty, and its own diverse student interests and needs, the goals selected should be unique to the district and must be developed locally. The following general goals are recommended for possible adoption:

1. Designate one or more staff members as environmental education specialists or coordinators to ensure continuing development of environmental education programs in each school in the district.
2. Establish an interdisciplinary curriculum design that infuses the concepts and skills necessary for environmental literacy into all subject areas and provides every student at every grade level with meaningful learning experiences. This could include a scope and sequence of environmental objectives or concepts to insure continuity of learning experiences. (See pages 78–82.)
3. Design strategies to take full advantage of community resources, bringing them into the classroom or taking students out into an expanded "community classroom."
4. Develop and maintain an up-to-date file of resource people, places, and learning opportunities to foster better utilization of community resources.
5. Develop guidelines, school policies, and procedures to be considered when participating in various environmental education activities such as field trips and use of outdoor study areas.
6. Develop resource kits for teachers in major disciplines, providing goals, learning activities, and evaluative techniques.
7. Increase the use of school grounds as outdoor learning sites and identify or acquire areas for development of outdoor study areas (government owned natural areas such as state forests, fish hatcheries, parks, neighborhood and community sites).
8. Provide in-service environmental education for every staff member.
9. Review (1) school building operations, (2) proposed building or remodeling plans, (3) purchasing practices for educational materials, and (4) utility and maintenance practices to make each consistent with known environmental principles.
10. Involve administrators, teachers, students, and citizens in assessing the environmental impact of proposed school board and community actions.

Single School Goals

The goals of an individual school may be similar to those of a district, but school goals may be more specific.

1. Designate one or more staff members as environmental education specialists or coordinators to ensure continuing development of environmental education programs.
2. Involve every student at every grade level in the school in the examination of environmental relationships; in the development of skills of inquiry, problem solving, decision making, computation, and communication through study of specific community or school environmental situations; and in the development of awareness, concern, and responsibility for environmental problems and their solution.
3. Establish a curriculum committee to devise a system for infusing environmental education into the existing curriculum. This could include a scope and sequence of environmental objectives or concepts. (See pages 78–82.)
4. Make full use of the school grounds and other suitable areas as outdoor learning sites. This may include activities necessary for further development, landscaping with native vegetation, preservation of existing natural sites.
5. Establish a list of parents, staff, and other community people who have interests and background that can be helpful for environmental education.
6. Provide for assembly programs and displays, especially on designated weeks (Earth Week, National Wildlife Week).
7. Establish a library of environmental education materials.
8. Establish a program of well-planned field trips to enrich such areas as science, history, government, and the arts.

9. Provide every member of the staff with in-service environmental education learning experiences.
10. Improve community-school cooperation and understanding.
11. Participate in the President's Merit Awards Program. (Get information from Mrs. Alice Linder, Environmental Education Consultant, South Carolina Department of Education, Columbia, South Carolina 29201. Phone: 758–2652.)

DEVELOP A PLAN

Developing a plan is like taking a trip. Several questions must be considered:

Where are we now?

Where would we like to be?

What routes are available to get us there?

Who is involved in getting us there?

What time will we leave and arrive?

How much will it cost?

What will we see when we arrive?

How will we know when we get there?

The environmental education committee should have development of a master plan as one of its initial responsibilities. This plan should provide a framework by which the designated goals may be achieved. It also may serve to:

1. Identify the roles of students, teachers, administrators, consultants, and community resource persons and their relationship to each other and the total program.
2. Provide the basis for decisions and policy.
3. Interpret the program to the public and solicit their support.
4. Provide continuity of development over an extended period of time.
5. Determine priority of needs, test ideas, determine directions, and arrange strategies in an operational format.
6. Provide a basis for review and evaluation. *(reference 35)* Don't do it all at once. It's good to have something to look forward to. Add and revise each year.

For greater detail see:

South Carolina, State Department of Education, Office of Planning, "Planning for Educational Improvement" (1975).

Sample District Plan

1. Assess and prioritize local environmental education concerns, problems, and needs.
2. Establish goals and prioritize them (possible in brainstorming sessions).
3. Identify resources available for school use.
4. Propose strategies and activities for reaching goals.
5. Identify specific capabilities and roles of different persons, agencies, and organizations, coordinating all activities that maintain lines of communication.
6. Determine constraints and problems and propose alternative solutions.
7. Prepare time line (schedule), budget, and evaluation instruments.
8. Write a working paper or plan.
9. Present plan for critical review to Environmental Education Committee, School Board, and Superintendent.
10. Obtain necessary resources and implement pilot project.
11. Evaluate to see if objectives have been met.
12. Recycle and make necessary revisions or additions.

For a single school, the plan may be similar, but additional steps might include:

1. Involve teacher and student representative from each grade level, teaching team or subject area, and the librarian in all planning and phases of implementation.
2. Establish procedure for integrating environmental information and activities into the curriculum.
3. Establish curriculum committee to develop scope and sequence of environmental education objectives or concepts in order to provide continuity. This should include community problems.
4. Establish logistical policies and procedures for off-campus activities.
5. Provide staff in-service.
6. Determine which class or team will be responsible for each task.

COLLECT INFORMATION

Various types of information are needed and become increasingly valuable as plans for an environmental education program progress. Such information includes the following:

1. Needs and concerns
    - a. Local and regional problems and concerns (population, pollution, waste disposal, litter, development, and land use)
    - b. Educational needs and concerns (dropouts, career education, computational and communication skills)
    - c. Community and school improvement projects (erosion control, beautification, landscaping)
2. People
    - a. School staff members who possess the interest and background that would be helpful in an environmental education program
    - b. Professional environmental specialists from governmental agencies, universities, and private organizations who are available as instructors or available to provide technical assistance; city and regional planners; state and local persons from Forestry, Land Resources, Water Resources, Fish and Wildlife Commissions, Parks, Recreation, and Tourism, Health and Environmental Control, National Forestry, National Parks, and Soil Conservation Service; private groups such as the PTA, Wildlife Federation, Garden Clubs, Audubon Society, Sierra Club; and industry. (See Appendixes A and B.)
    - c. Local experts—a parent skilled in nature lore, a citizen with a hobby of meteorology, a member of the local historical society, a talented senior citizen
3. Status of existing programs and projects
4. Available instructional materials

a. Review of the literature (recognized school programs and materials)
b. Local and state audiovisuals
c. PATE guides and other activity-oriented curricular materials
d. Library references and keys for identifying various organisms

5. Places and learning situations

a. School areas that could be used or developed for environmental study
b. Local land available for environmental study areas
c. Other off-campus areas (industries, parks, cemeteries, public gardens, forests, etc.)

To prevent the possibility of annoying individuals and agencies and to avoid needless repetition of data collecting procedures, it might be helpful to establish a central district file to collect and store data related to the local environment. A simple system might consist of file cards for locally collected data or data-reduction summaries, plus a library of related publications.

DETERMINE CURRICULAR CHANGES

There are two major approaches to environmental education. One considers that environmental problems and information are derived from several disciplines such as:

Science	**Social Studies**	**Economics**
Ecology	How to pass a law	Jobs
Technology	Zoning ordinance and land use	Cost of pollution

All disciplines can make their own unique contributions to environmental literacy. Through the natural sciences, the components of the environment are discovered and the interrelationships, changes, and factors for its maintenance are determined. The social sciences are involved in transmission of awareness of our cultural heritage which, to some extent, influences our attitudes and values and thus our behavior. They are also concerned with ways of effecting change through beneficial societal action.

However, population, pollution, pesticides, land use, and energy are by nature interdisciplinary. Therefore, it is most important that all concerned disciplines be cooperatively involved in preparation of environmental education curriculum. We can not expect students to be able to integrate bits and pieces from various classes without some direct assistance.

The other approach to environmental education considers that the concepts and skills from ALL subjects can be taught through realistic environmental situations and learning experiences. By utilizing environmental concepts, inquiry, issue-oriented methods, and direct experiences in the local community, a teacher can initiate interest, motivation, and greater enjoyment of the learning process.

Several South Carolina school districts have adopted the ECOS method of infusion of environmental education into the curriculum. This infusion process involves a team of teachers who:

choose a unit of study

examine a list of 18 environmental categories and decide which ones they would like to infuse into the units (see pages 68–72)

consider local problems of interest and concern to the students

design activities to go with the environmental categories

list resource needs—both materials and people

identify necessary administrative support

try it with their students (see Appendix I)

Other districts have approached curricular changes in a variety of ways. Some have added an interdisciplinary course at the high school level. This may be a year course, a semester course, or a quin or quarter course. Some schools have several quins that could be considered environmental education courses in microbiology and water quality, field ecology, or oceanography. Some have added a unit or modified a unit of study in existing content areas. Others are using independent studies, field trip experiences, individual or small group school-site projects, extracurricular club activities, and special summer programs.

Indicators of environmental literacy have been designated by a committee of South Carolina citizens. (See page 47.) Lesson materials are available on all grade levels in *People and Their Environment*. Together with this model for curriculum planning, each district has the basic tools to design its own program to meet its own needs and philosophy. All you need is your own ingenuity—and that is the key.

Several things to consider when designing your curriculum:

1. Involve students in planning as well as carrying out the plans.
2. Revise and update continuously, utilizing environmental topics of immediate concern.
3. Make full use of community resources as well as school resources. In this way modifications need not be costly or require extensive new equipment.
4. Review and utilize existing materials to prevent duplication of efforts.
5. Provide sufficiently diverse materials and activities to meet the needs of students at varying levels of development.
6. Keep materials open to student modification.
7. Coordinate with other subject areas to reflect the interdisciplinary nature of environmental education. Environmental literacy cannot result from piecemeal procedure and incidental trips and experiences.
8. Include opportunities for value clarification and increased assumption of responsibility.
9. Involve students in problem discovery and solving activities.
10. Cooperate with other faculty members to develop a K–12 sequence of themes and activities based on developmental learning patterns, content materials, and activities that are correlated with the basic concepts and understandings to be developed at each grade level.
11. Examine existing curriculum to determine areas that could easily be correlated with environmental topics and issues.

PROVIDE IN-SERVICE EDUCATION

Environmental Education is more than turning students loose in the out-of-doors. True environmental education requires skills and leadership ability. The responsibility for teacher preparation should reside in the colleges and universities, but at present very few South Carolina teacher-training institutions provide courses in environmental studies. Since the majority of teachers who are presently teaching will still be teaching 10 to 20 years from now, it is evident that in-service education is a necessity.

At present the South Carolina Advisory Council for Environmental Education sponsors three summer institutes for teachers. These are offered at Clemson, the University of South Carolina, and The Citadel. These three-week summer sessions provide teachers with opportunities to become aware of South Carolina's unique and varied natural resources as well as with the various commissions whose jobs are to monitor and maintain them.

The State Forestry Commission also offers a brief three-day course for one hour credit. People trained in this course go out and train others with the same materials.

Workshops and courses of study can be arranged by districts for teams of teachers who can then return to their schools and share their information with their colleagues. Arrangements can be made through local colleges and universities or the State Department of Education to obtain instructors and course credit.

In planning the teacher education program, the coordinator should consider the factors in the following checklist.

In-service Checklist

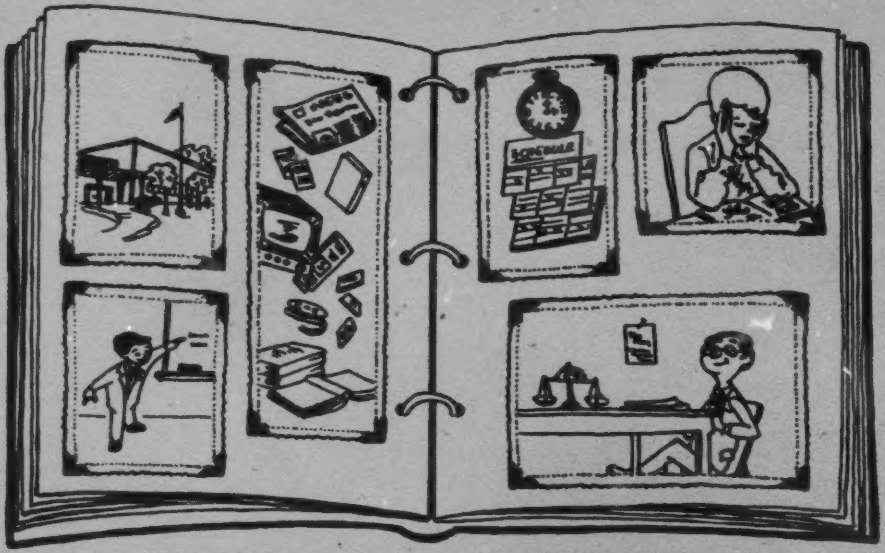
1. Is the program designed to train teachers who will be implementing a new environmental education curriculum?
2. Will the program give teachers increased confidence in their ability to use environment and environmental problems in their teaching?
3. Does the program provide guidance in the use of time, of space, and of physical facilities in the school, on the school ground, and in the community?
4. Does the program provide opportunities for teachers to become familiar with teaching materials for implementing environmental education?
5. Does the program provide experiences in methods of inquiry, problem solving, and decision making and provide the opportunity to attack at least one problem situation?
6. Does the program increase the teacher's understanding of the nature of environmental education and its value in the educational curriculum?
7. Does the program provide opportunities for teachers to participate in experiences and investigations in which the children will be involved?
8. Will the teachers be taught in the same manner in which they will be expected to teach?
9. Does the program provide opportunities for teachers to become acquainted with local information resources?
10. Does the program provide examples of activities and methods for infusing environmental education into existing curricula?
11. Will the program demonstrate exemplary programs and materials and facilitate the dissemination of good educational practices?
12. Does the program provide opportunities for teachers to study the community's natural resources under natural conditions?
13. Does the program stress attitudes rather than vocational skills, appreciation rather than scientific nomenclature?
14. Does the program emphasize local resource problems without neglecting state, national, and international problems?

Learning is accomplished best through small group interaction. Therefore, workshops should be designed for interaction among participants. Teams of teachers should be organized to represent different disciplines within a single school, as well as all grade levels. If possible, students should be included in the teams and have an opportunity to participate in the activities.

It is the responsibility of the school system to initiate and carry out continuing specific training necessary to implement environmental education. If the program is to be successful, the teachers of the district must have adequate preparation.

PILOT THE PROJECT

1. Choose the site of the project. Select one to three pilot schools (preferably one elementary, one middle, and one high school) which will:
    - a. establish an environmental education study area or site
    - b. develop environmental education curriculum goals
    - c. develop a set of activities to reach the goals
    - d. try their environmental education curriculum, including out-of-school activities
    - e. appoint a coordinator of the school program
    - f. share their experience and materials with another school
2. Train personnel involved
3. Allocate necessary resources
4. Provide released time and flexible scheduling for planning and implementing the project
5. Conduct project
6. Evaluate



SUPPORT PROGRAM

Regardless of the extensiveness of the facilities or the sophistication of the hardware, the primary ingredient in any learning situation is the teacher. Nothing is more important than the teacher who manages a rich learning environment for the students. However, even the best teachers cannot work at their best without the support of administrators and the cooperation of colleagues.

The Librarian. The librarian is a vital support person in any environmental program. He is the one to whom teachers and students go when they want an answer to a question, information about community history, or the name of "this snake." He is the one who can provide them with a link to other resources in the state network for valuable research information.

The Para-professional. The para-professional also provides support to the teacher and serves as a special link with the community. An informed and knowledgeable aide can promote valuable, positive public relations as well as teacher assistance. The aide may serve as a group leader and chaperone on field trips and assist students in many community projects.

The Coordinator. A district or school coordinator can lend special support to the environmental education program and teachers involved. This person provides information concerning new materials and methods, conducts workshops, identifies resources, and contacts community resource people. The coordinator may also assist in the design and conduct of field trips and in the development of school sites.

The District Superintendent and Staff. District administrators have the ultimate authority and opportunity to provide support to any school program. They can create a desire to excel and enthusiastically encourage curricular change and community-school cooperation through such specific actions as:

1. Provide operating procedures, guidelines, and directions for field trips, development of school property, and school-community interaction.
2. Provide and encourage appropriate in-service activities.
3. Enable staff members to visit other environmental education programs and projects to obtain ideas and information.
4. Encourage participation in contests and other activities and provide publicity for the entries.
5. Acquire additional land and make necessary arrangements to assist students and teachers in its development.
6. Provide adequate funding for necessary materials and equipment.

The Principal may share many of the above responsibilities but support the program in additional ways:

1. Flexible time schedules
2. Arrangements for field trips and transportation
3. Released time for planning and developing materials
4. Necessary resource materials
5. Direction and constraints (such as policies for off-campus activities)
6. Staff motivation, encouragement, and an environment conducive to innovation, cooperation, and development of a rich and varied learning environment for the students

The Community. Perhaps the best place to start developing community support is in the school with the PTA, assembly programs open to the public, open houses, etc. Once a project begins, it is important to keep the public informed on progress. One method of transmitting information is through student presentations. Some students have already developed slide/tape presentations; others have made original movies. These could be taken to a variety of organizations by students who would provide the program for that meeting. These presentations may result not only in publicity but in offers of help from the organizations or from individuals in attendance.

Experience indicates that the public is aware of the importance of environmental education and can be counted on to support any educational endeavor which can assure better education for youth.

Community resource people are usually happy to provide support and assistance. These people should be invited to assist in the planning of a project and then kept informed of progress.

Publicity is perhaps the key to community support. Newspaper, television, and radio coverage of special projects is essential. Participation in the President's Merit Awards Program, the Governor's Beautification Contest, and community improvement projects can result in favorable exposure for the environmental education program. When seeking publicity and support, keep the kids on "center stage," the teachers in the background. Let students obtain interviews by TV and newspaper reporters, submit writeups to the press, and explain their activities. They will not only receive valuable publicity and community support but a boost to their "self-concept."

EVALUATE AND RECYCLE

How far have we come?
How well did we do?
Are we still on course?
Do we still want to go to the same place?

Some form of evaluative instrument is needed to examine existing curricular programs in environmental education as well as to evaluate new or revised ones. Numerous evaluative instruments have been designed to determine student growth in environmental education. However, it is also important to analyze the structure of your program, the nature of materials used, and the attitudes and competencies of the staff members. The following checklists have been developed to assist.

Does Your Environmental Education Program:

1. incorporate environmental resource materials into selected areas of the school curriculum at all levels of instruction (K–12)?
2. include field trips into the community and extensive use of school property?
3. increase student's understanding and appreciation of the basic principles of interdependence of living things and their environment?
4. encourage students to accept responsibility for learning and for maintenance and improvement of their environment?
5. provide facilities for conducting environmental studies—adequate library and outdoor study areas?
6. provide for in-service teacher education?
7. provide flexible scheduling?
8. encourage team planning and team teaching to provide a more realistic interdisciplinary approach to environmental problems and education?
9. involve students in individual group activities and action programs to improve schools and other local environments.
10. utilize a variety of teaching-learning strategies—reading materials, audiovisual materials, field trips, surveys, gardens, etc.?
11. provide year-round experiences involving classwork, field work, recreation, gardening, camping, etc.?
12. provide opportunities for all children to be involved in the activities?
13. have adequate financing?
14. involve cooperation of community, staff, and students?
15. identify and incorporate community environmental problems into the curriculum?

Program Analysis—A Self-Check

(reference 8)

1. Structure

☺ Our program is flexible, incorporating new ideas and materials as needs indicate.

😐 Our program could use new and innovative ideas to upgrade its quality of education.

☹ Our program is highly structured. Adopting and implementing an environmental education program would be difficult.

2. Facilities

☺ Our building, surrounding area, and library facilities are generally adequate to handle an environmental education program.

😐 We have adequate library facilities but no school ground area.

☹ We lack audiovisual equipment and our yard is nothing but sand.

3. Staff interest

☺ Most of our teachers provide for learning experiences outside of the classroom (field trips, demonstrations, etc.).

😐 Our teachers are cooperative and open for change and will support an environmental education program.

☹ Our teachers have shown little enthusiasm for outdoor and community learning activities.

4. Staff training

☺ Most of our teachers are sufficiently trained to handle an environmental program in their classrooms and in cooperation with other teachers.

😐 Few of our teachers have had training. A workshop has been provided.

☹ No teachers have had any environmental educational training.

5. Attitudes of administration and staff toward emphasis

☺ A positive emphasis should be placed on environmental education.

😐 A general, occasional emphasis should be placed on environmental education.

☹ Emphasis on environmental education should be left to the teacher.

6. Attitudes toward curriculum

☺ Environmental education should be a major part of the total curriculum.

😐 Environmental education should be a part of the science program only.

☹ Environmental education should be an extra activity.

7. Attitudes toward parent involvement

☺ Parents should become actively involved in environmental education.

😐 Some parents may be invited to participate in certain activities (help with a field trip).

☹ Parents will have no involvement in environmental education.

8. Materials

☺ Materials have been designed by interdisciplinary teams of teachers based on local needs and concerns of students and community.

😐 A combination of teacher-made materials and published materials is adapted to the needs of the students.

☹ If environmental concepts are included in a textbook, they are discussed.

9. Organization of the learning situation

☺ Organization is student centered with use of learning stations, learning activity packets, and contracts. Students choose from a wide range of interdisciplinary learning materials and activities designed to develop environmental education concepts in a logical sequence.

😐 Organization is based on units of study designed to develop specific concepts in a particular sequence.

☹ Environmental concerns are discussed when they appear in the text or are brought up by students.

10. Use of community

☺ The equivalent of 5 weeks is spent in learning outside of the classroom—in the school building, on the grounds, or in the community.

😐 Several days are spent in learning outside of the classroom.

☹ No time is spent in learning outside of the classroom.

11. Student activity

☺ The majority of students have been involved in individual or group activities involving environmental interrelationships, school or community improvement or problems.

😐 Only students from science and vocational classes have been involved in community or school environmental activities.

☹ Only agriculture students are involved in environmental learning activities.

12. Community-school interaction

☺ Many community resources have been used (speakers, field trips, etc.), and students have taken part in community improvement projects (such as water testing and clean-up days).

😐 Community resources have been used in the classroom, but the school has not been involved in community environmental projects.

☹ There is no interaction between school and community.

Teacher Self-Evaluation Checklist

To what extent do you:	Often	Occasionally	Seldom	Never
1. Present specific lesson units which deal with the environment?	_	_	_	_
2. Present specific lesson units on the pollution problem?	_	_	_	_
3. Provide for visual aids which deal with environmental problems?	_	_	_	_
4. Use student ideas regarding environmental concerns in developing your teaching units?	_	_	_	_
5. Provide resource materials on environmental concerns?	_	_	_	_
6. Provide outdoor educational experiences for your students?	_	_	_	_
7. Use resources of the community in your teaching?	_	_	_	_
8. Provide experiences which encourage children to observe the beauty of nature?	_	_	_	_
9. Provide for learning experiences which emphasize the interrelationship between natural things (such as soil and water, soil and animals)?	_	_	_	_
10. Plan demonstration units which show man's dependency on the soil, water, and air?	_	_	_	_
11. Help students understand that you cannot disturb something in nature without disturbing other things?	_	_	_	_
12. Present lessons which show how things adjust to environmental conditions?	_	_	_	_
13. Discuss with students how things in nature and the world are constantly changing?	_	_	_	_
14. Help students recognize specific community problems which demonstrate waste?	_	_	_	_
15. Provide learning experiences which show that habitual waste of our resources will cause serious problems?	_	_	_	_
16. Provide learning experiences which allow the student to identify his responsibility in regard to such problems as litter and pollution?	_	_	_	_
17. Demonstrate how lack of responsibility on the part of the individual can affect the lives of others?	_	_	_	_
18. Discuss such topics as insecticides and industrial wastes which endanger our environment?	_	_	_	_
19. Encourage students to discuss and try possible solutions to environmental problems?	_	_	_	_

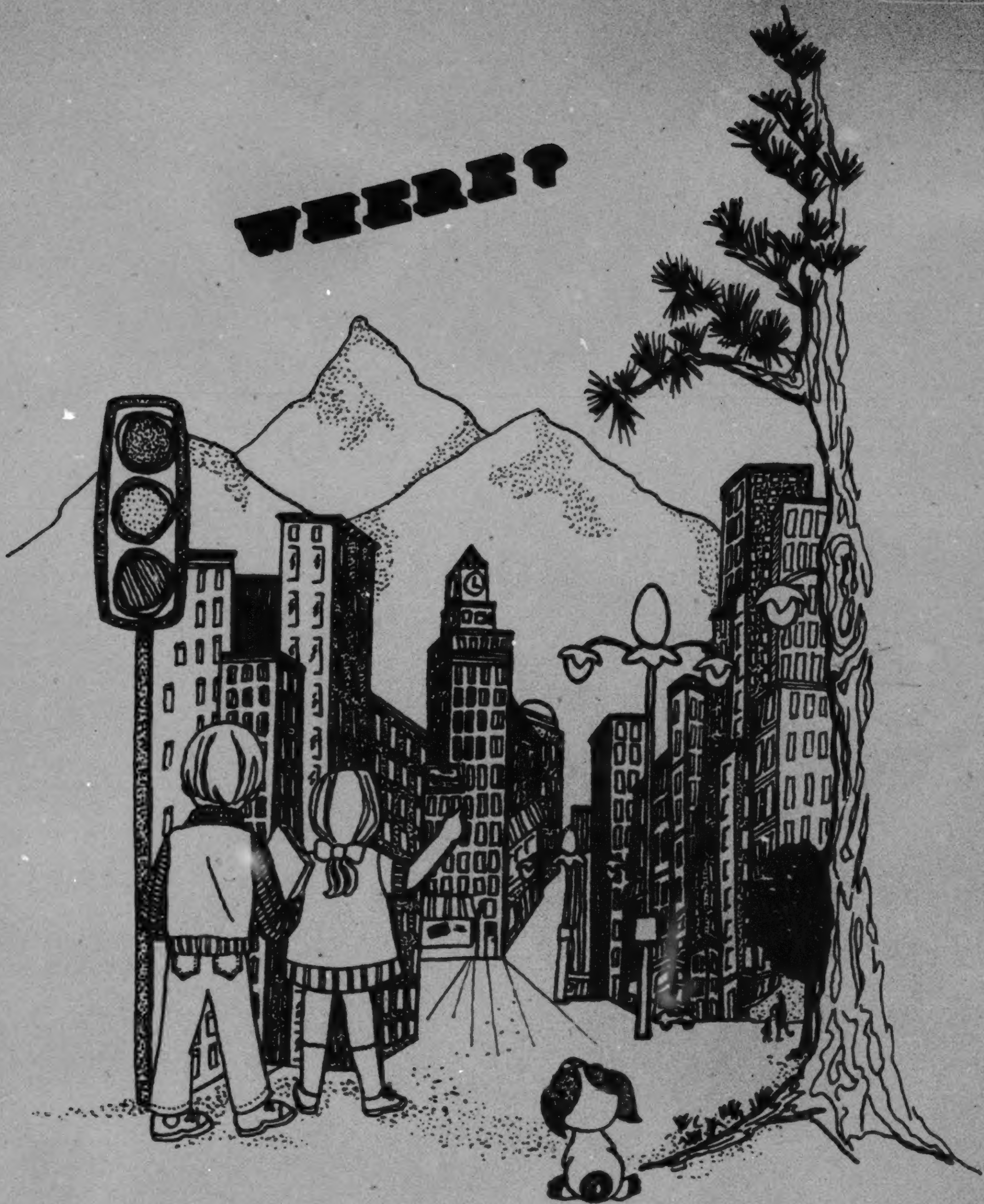
Using the basic indicators of environmental literacy, *People and Their Environment*, and this publication as sources of ideas, the teacher can develop courses, units, learning activity packets, independent studies, field trips, and any number of educational experiences to achieve the identified outcomes.

After choosing the indicators that the teacher wishes to use, more specific behavioral objectives should be listed which describe what the student will be able to do after participating in a given activity. These objectives should form the basis of the evaluative instrument.

However, in the last analysis, the results of a good environmental education program should be evident in the behavior of the students. For example, do your students:

1. show more tolerance of other points of view?
2. conserve and reuse materials in the classroom?
3. keep the classroom neat and tidy?
4. show respect for school property?
5. work on committees to plan and carry out school improvement?
6. show respect for property in the neighborhood?
7. cooperate with their families to maintain attractive home property?
8. read and choose activities that will help increase their knowledge of the environment?
9. engage in programs and projects that relate to the environment and its maintenance?
10. show care and concern for all living things?
11. turn out lights when leaving the room?
12. know and analyze pro's and con's of environmental issues?

WHERE?



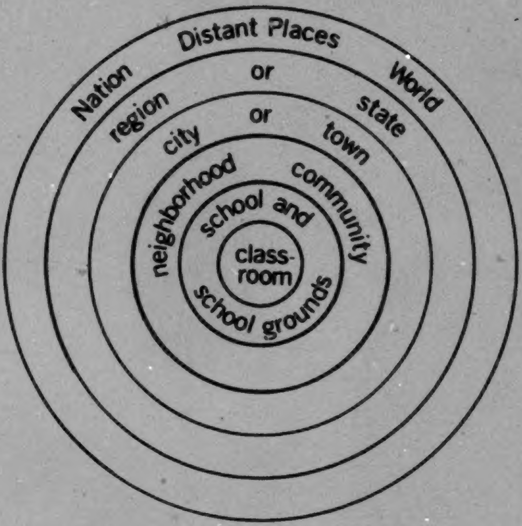
WHERE?

A rich learning environment allows stress-free activity, appropriate space for interaction with others, solitary spaces for contemplation, and many opportunities for participation. The learning environment should provide choice and perceptual involvement, arouse curiosity and promote questions, experiments, and exploration.

An environmental study area may be any site or facility, park or urban setting, historical landmark or scenic place used by a teacher to help students understand the relationships between the subject or concept being taught, the environment, and the human impact. Such resources might include the classroom, school building, school property, shopping centers, neighborhood, water treatment plants, police and fire stations, industrial parks, streams, museums, wildlife preserves. The list depends on your locality and ingenuity.

Natural and man-made environments can bring to life concepts found in most school textbooks, and the increased awareness and sensory perception make learning more exciting and lasting. To feel, smell, see, and hear the components of the environment is to grow in understanding and sensitivity.

The environmental classroom can be pictured as a series of concentric circles. When children are very small their world is small, and environmental studies should center around the school and school grounds. As the child matures, his world expands until he becomes concerned with the global environment.



CLASSROOM

(reference 21)

The classroom can become as rich a learning environment as any site in the area. Aquaria (salt water and fresh), terraria, incubators, plants and germinating beds, maps, models, and designs add a new dimension to any classroom. Informal furniture arrangement, tables for student activities, attractive learning stations with materials, and interesting activities become an invitation to inquiry and discovery. Audiovisuals, guest speakers, and "things" students bring also add to the variety of potential learning resources.

Not only "things" make a classroom environment. People are also an important ingredient. Teachers and students interrelate and depend on one another and the physical environment. How often have you had a child in the class who changed the "whole atmosphere of the class"? The teacher usually determines whether the environment is relaxed or threatening. Physical features determine the kinds of activities that can be performed. Temperature, air circulation, humidity, lighting, and other physical conditions affect the classroom environment and suitability for optimal learning.

SCHOOL AND GROUNDS

Teachers should look in their "own back yard" for diverse, free resources. For example, take a walk through your school building. What architectural and classroom designs lend themselves to economy of energy use? What structural features illustrate mathematical angles? What rock or brick illustrates weathering? What problems exist inside the building? Is litter a problem? Unequal heating? Insufficient lighting? Noise?

The custodian may lead a field trip through the school building to explain heating and electrical systems and ways to conserve energy. The lunchroom supervisor could conduct a study of garbage and trash disposal. Students may map plumbing pipes, noting water entry and exit sources. Food preparation, maintenance, litter, transportation, and energy use are all potential subjects for study, surveys, and campaigns.

Students pass through their school grounds every day, but most of them are unaware of the environmental problems that abound. They ignore or simply become accustomed to the litter, the ugliness, the pollution, the poor planning of their world. The school property is probably the most valuable resource for direct learning experiences, though often the least used. Natural features of soil, air, plants, and animals are available for observation by the budding scientist. Arts and humanities classes can study aesthetic qualities. Social studies classes can study the historical and economic significance of the site. ALL TEACHERS and STUDENTS should have an opportunity to become involved in the planning and use of outdoor study areas.

Are you teaching the concept of change? Observe the rusting drain pipes, the cracked concrete, erosion, rotting logs, plant growth, student growth—all illustrate constant change in the environment.

Do your students perceive the diversity of living things? Study weeds in the front of the school in contrast to the ones behind the building. Note and record the different species of birds that come to your feeder. See how many different kinds of rocks you can find. Which ones are attracted to a magnet?

In urban schools, a rooftop garden, weather station, air pollution detection station, and sound pollution devices can provide valuable learning experiences. Courtyards can become simulated natural habitats and convenient places to house animals. Even the space along the building wall can be used for weather stations and bird feeders. Studies of traffic, public transportation and services are also useful.

Close examination of the school yard (see Appendix F) can result in a list of resources for development of environmental concepts as well as concepts in various subject areas. Specific parts of the school grounds can be identified as examples of good or poor land use. Projects can be designed to correct problems to maintain and improve the grounds and to illustrate good environmental practices. Student participation in preparation of learning sites also leads to pride in their accomplishments.

Activities on the school's property are especially advantageous in that they do not require arrangements for field trips or time spent traveling from the school to a distant location. Vegetation, soil, and other environmental factors are also usually more like those around the students' homes.

The school facility, its buildings, and property can serve as a study center for solving problems not only of the classroom but also of the community. A class could collect litter along the highway frontage of their school or construct a picnic area or nature trail for school and community use. The new awareness of individual responsibility should spill over to the community and result in a cleaner, more attractive, and healthier community.

Steps in Establishing Outdoor Study Areas

Most of the work in planning and developing your environmental study area can and should be done by students. They can plant trees and shrubs. They can build trails, bird feeders, bird houses, benches, and ponds with the guidance of teachers and the technical assistance of local experts. Successional plots, trail guides, and flora and fauna inventories can be class or small group projects. Concerned individuals and businesses in the community may donate needed materials. Major construction (such as building a large pond) will need to be contracted by the district.

The school property offers an opportunity for students and teachers to learn and work together in the process of environmental management and planning. If you plan to develop outdoor study, the following suggested sequence of activities may prove helpful:

1. Administrative support and an enthusiastic person to chair a planning committee
2. Statement of need and purposes of site development
3. Formation of school site committee (students from each homeroom, an interested teacher, and community member)
4. Collection of information (see Appendixes E, F, and G)
    a. site analysis—identify prospective learning sites (soil and topographic maps and aerial photographs can provide information such as site boundaries, contours, building shape and location, swales and drainages, natural vegetation and other features (see Appendix H)
    b. site development possibilities—visit a variety of outdoor study areas at other schools and use reference materials (zoning ordinances, safety and health regulations, boundaries, access, etc.)
5. Development of educational specifications
    a. what concepts and skills do you plan to teach?
    b. what environmental activities would make learning more effective and meaningful?
    c. what kinds of sites or learning stations are needed?
6. Development of a plan to meet the needs of the curricular program
    a. land use plan
    b. educational specifications
    c. activities necessary for development of special learning sites (involving many students results in less vandalism)
    d. teacher education—methods, materials, educational potential for all subject areas
    e. projected cost for development and maintenance, including possible sources of donations and funding
7. Inventory of human and materials resources available locally and from the state (source materials available and needed)
8. Presentation of plan to administration and board for approval
9. Development of detailed plans for implementation, including time line, persons responsible, and plans for public information and involvement (changes recommended, construction needed, objects to be removed)
10. Implementation of plan—involve TOTAL school population and interested members of the local community

Each outdoor classroom is an individual project. It must be planned according to the size and shape of the area available, topography, soil characteristics, and unique features existing on the particular site. It may involve several acres with interconnecting trails along a stream or a small courtyard or area along the side of a building. Some sites lend themselves to construction of a large pond or marsh. Others may use a child's wading pool set in the ground. When planning your outdoor learning facility, be sure to consider:

1. Have precautions been taken to avoid damage to valuable existing sites?
2. Is it within walking distance of classroom?
3. Is it large enough to contain a wide diversity of life?
4. What is its carrying capacity? Number of students per week?
5. Who will use the area—age of students and community groups?
6. Will construction have a harmful impact on the existing natural environment?
7. Is there a stream that can be used to study aquatic life? If so, would a dam be desirable to make a pond?
8. If no stream is available, could a pond be excavated and filled from ground water?
9. Have play areas been considered from the point of view of child development, carrying capacity, manipulative facilities, encouraging cooperation, developing social skills and opportunities to become better acquainted with the physical world and the students' own capabilities?
10. Are your trails winding rather than straight? A winding trail lets students anticipate what is beyond the next bend.
11. Has the site committee reviewed all study projects for their impact on the property?
12. Are trail markers desirable? Is a map needed?
13. Is there a place for an animal tracking station?
14. Has a weather station been constructed?
15. If there is gully erosion, have plantings been considered to retard it and to teach erosion and its correction? Vertical iron pipes may be placed in the gully with the ground level painted on them so that students can see how much erosion has taken place from time to time.
16. Dead trees should be left standing unless there is danger of their falling and hurting someone. These provide nesting sites for birds.
17. Rock outcrops and tree stumps can be used as geological calendars.

18. Is there an undisturbed area marked off for study of stages of succession (where changes are recorded by a succession of students who repeat the study each year)?
19. No land? Have you considered corners of the playground? One for succession, one for birds, one for soil types, one for weather study, etc. (For additional ideas see reference 43.)

Possible Projects

Your school property is one of the richest learning environments available to teachers. Other than a place to park your car, hold athletic contests, and have recess, the schoolgrounds offer great educational possibilities. As William Stapp has said, "The potential for developing environmental education facilities (on any school site) is limited only by the boundaries of one's imagination, resourcefulness, and enthusiasm."

The following list suggests a few possible environmental study projects in your school ground. *(reference 21)*

- air pollution testing stations
- animal food plots
- beehives
- benchmark and compass
- bird banding station
- bird feeders and nesting boxes
- controlled burning demonstration area
- compass course
- compost pile
- dam
- fern garden
- field or meadow
- footprint walk
- fruit tree area
- greenhouse
- ground cover plots
- insect collecting stations
- landfill demonstration
- lawn plots
- nature trail
- observation hill
- orienteering center
- outdoor classroom
- outdoor cooking
- playgrounds
- pond
- rock garden
- retaining wall
- road cut
- rustic bridge
- shelter belt
- site orientation center
- soil erosion study
- soil profile demonstration
- soil variety plots
- solar heating demonstration
- stream
- sundial
- swamp garden
- telescope viewing area
- tree nursery plot
- vegetable garden plots
- water quality sampling stations
- water ecosystem
- weather station
- wildlife pond and nesting island
- windmill
- woodland community

Multiple Use and Your Tax Dollars

The high cost of land and construction has forced many communities to take a closer look at multiple use of facilities. Some communities have taken advantage of special funding assistance to develop optimum land use. Others have built the school adjacent to a community park or recreation center for joint use of facilities. Some school districts have drawn up contracts with local recreation commissions to share property. Many South Carolina FFA camps which are used during a relatively short period of time, might be used year-round under cooperative arrangements. State parks, state and national forests, industry and private individuals are often willing to cooperate with a school or school district.

Explore your community. Get to know the people. There may be more available opportunities in your area than you ever dreamed of. The dollars saved are not only recreation dollars or school dollars but dollars that affect every member of the community.

NEIGHBORHOOD OR COMMUNITY

Community and neighborhood sites offer additional opportunities for learning, especially when school sites have limitations and lack diversity. In urban districts, there are industrial sections, blighted sections, apartment residence sections, parks, riverbanks, transportation depots, sewage, garbage and refuse disposal areas, and many others. All of these environments may become components of the total school curriculum.

A neighborhood site is an area within walking distance of the schools. It may be a downtown city area, a suburban area, or rural farm environment. Its jobs, its transportation system, and its life style (who lives where, who eats what) are all possibilities for observation, surveys, and study. Environmental abuses may be identified and possible solutions proposed and acted upon. Students can become active members of the neighborhood community through participation in various improvement and beautification projects. Additional trips could be taken to study and compare the school neighborhood with other areas of the town or city.

While studying the physical and geographical features of their neighborhood and city, students also learn about its human resources. There are many "teachers" who operate stores and perform a multitude of services. They can be of great assistance if they are involved in cooperative planning and implementing your study project. Business, industry, union leaders, government officials, and media personnel are all good sources of information and assistance.

What do you know about your town? Through a study of Main Street, students can achieve an understanding and appreciation of the physical and historical significance of their town. If students are encouraged to discover how some of the functions of their community really operate, how some things about their area evolve, and how some aspects of it could be improved, they develop appreciation for "our town." The community is especially appropriate for small group study. A choice of Learning Activity Packets is one possible strategy. The following LAP'S are a sample of activities by an eighth grade class. *(reference 37)*

1. An old graveyard—a primary source of our town's history.
2. Decibelmeter—monitors noise level in various spots in town.
3. John Rutledge, Frances Marion, General Andrew Pickens, or other heroes of local history whose life can be appraised.
4. Monument or famous landmark and its significance.
5. Automobile Dealership—how do you purchase a car?
6. Pollution Kits to monitor air quality of the Main Street area.
7. Fire Department—structure, function, and equipment.
8. Traffic—amount, location, and influence of traffic on the life of the town.
9. Gasoline Station—structure and function of a gasoline station.
10. Cancer, TB, or other health agency—organization and function.
11. Police Department—organization and function.
12. Building Inventory Architecture—to recognize the components of architecture and compare and contrast architectural styles.
13. Our Town, Then and Now—developing library skills through a study of town changes.
14. Directional Activity—developing compass and mapping skills.
15. Pedometer and Stopwatch—calculating time and distance.
16. County Office Building—office's function, organization and services available.
17. Communications—news media and telephone offices.
18. Solid waste—management of street litter and solid waste from business.
19. Zoning and town planning—how is your town zoned?
20. Public Health—services available.

STATE AND REGIONAL RESOURCES

The country boy may not get excited about planting a garden in the school yard. He may know something about soils, plants and animals, but he may feel uncomfortable and strange in an urban environment. He may not be aware that the requirements for life, natural and physical cycles and patterns, are the same in urban and rural environments. It is beneficial to provide students with the opportunity to study other environments in their region or state. These include a visit to a city, to museums, zoos, historic sites, industries, and other places that are important to the people of the region. The greater the diversity of environmental experiences, both natural and man-made, the greater the understanding of the environment.

Woodfern Environmental Center was the first comprehensive regional center in South Carolina. It consists of 45 acres on the shores of Lake Hartwell. Nature trails, streams, weather station, greenhouse, organic garden, colonial study sites, and many others are available to students. Classes are scheduled for particular studies and transported by school bus. The curriculum and locally developed learning materials help students develop environmental understanding and wise practices.

Many states have found that regional resident centers can provide valuable experiences for students. The resident center is usually a place where:

a. living facilities and meals are provided.
b. students are involved in a week-long community living experience that promotes cooperation and group interaction in learning and working together.
c. the existing curriculum is enriched and vitalized with relevant and significant firsthand learning experiences based on the ecological study of the environment.
d. basic learning and manipulative skills are applied in environmental investigations.

e. all fifth and sixth graders have an opportunity to extend their understandings to a new environment.
f. students learn to appreciate the complexity, interrelatedness, and beauty of our natural environment.
g. students grow in human understanding through interaction between teacher and student as well as among students of different home environments.
h. children have opportunities to develop initiative, creativity, responsibility, and improved social relationships.
i. most learning occurs outdoors and involves activities which could not easily occur inside a school classroom.
j. individual or lifetime sports and hobbies are emphasized over team sports. For example, students may be introduced to archery, bird watching, photography, orienteering, and water safety rather than football or basketball.
k. teachers and youth—high school or college—may be trained in environmental education.

An urban school might choose a natural resident facility such as a camp. A rural school might choose a city facility. The most important factor is that a resident facility offers the students a new and contrasting environmental situation for discoveries and understandings. Subjects take on new importance and new meaning, new friends are made, and new hobbies and career possibilities explored. The resident center provides a unique opportunity for growth and curriculum enrichment. It provides experiences that children can refer to many, many times as they continue their schooling.

DISTANT SITES: NATION AND WORLD

Outside of the community is a larger world of even greater diversity and learning opportunities. A trip to the big city, to museums, zoos, special industries, the capitol, a special historic site, a marsh, pond, beach, mountain, or industry can expand awareness. A trip may even take you out of state to Williamsburg; Washington, D. C.; Gettysburg; or New York. Longer trips require the resolution of complex problems—travel, funding, hazards, and scheduling as well as legal considerations. These many factors added to the energy situation tend to make lengthy trips prohibitive.

PREPARING TO LEAVE THE SECURITY OF THE FOUR WALLS

The most efficient and effective learning takes place through direct experiences. Real objects and experiences should be brought into the classroom often. However, much learning occurs outside the formal classroom. A field trip may be no further than the cafeteria or furnace room, or it may extend to a distant state. They are not "just for fun." Each one should be thoroughly planned and serve essential educational objectives. Students should think of a field trip as a normal classroom experience in a different setting. When the outside experiences are preceded and followed by reports, films or discussion, UNFORGETTABLE learning does take place.

Preparatory Questions:

1. Have a teacher and students planned the trip together?
2. Has the area to be visited been examined carefully so the teacher knows what is there, its educational possibilities and problems illustrated?
3. Have pre-trip, on site, and post-trip activities been planned?
4. Have goals been identified? What do you want students to be able to do as a result?
5. Does the trip provide experiences appropriate to the characteristics and needs of the students and directly related to the existing curriculum?
6. Have all students received clear instructions as to their individual and collective responsibilities—reviewing procedures, rules concerning organisms, boundaries, etc.? Be sure to enforce all rules.
7. Have proper behavior and attire been discussed? (Stay within the roped off area, work in pairs, LEAVE THE AREA AS UNDISTURBED AS POSSIBLE.) If you lift a rock to see what inhabits the area under it, replace it when you have finished your observations. Do not needlessly pick flowers or bring insects or other organisms back to school.
8. Have group assignments been given and are members of each group completely aware of the task involved? If not using small group activities, at least give some general instruction. (Find the predators and prey in the environment.)
9. Does the trip permit firsthand study of objects and situations which cannot occur in class?
10. Have you prepared for emergencies? With young children, a buddy system can be organized so that each student is responsible for the safety of his buddy.
11. Have additional "field aides" been obtained as class size warrants?
12. Have all necessary materials been collected and packaged for transport?
13. Is adequate time available and have departure and arrival times been determined?

If requiring off-campus activity:

14. Have you studied district policies?
15. Have you consulted the principal and obtained his consent?
16. Have parents' permits been received?
17. Have plans been made with the person who will be in charge at the destination?

On site:

1. Are all students involved in activities?
2. Are areas for brief introduction and summary identified and students arranged in a circle for interaction and questions?
3. Does each student have writing utensils? (Cardboard clip-boards are easy to make; use string to attach a pencil.)
4. Are good leading and guiding questions used? (How might you use this plant to help you survive in the wilderness? Which of these areas should be preserved and why?) Listen to students. Don't tell; let them discover.
5. Are sequenced experiences selected that will proceed from simple to complex, from familiar to unfamiliar, from seen to unseen?
6. Are many senses being used?
7. Are students encouraged to look for discrepant events?
8. Are stops made at places where all can be involved and see and hear the instructor?
9. Is time provided for questions and independent investigations?

Upon return:

1. Have ideas and concepts been clarified?
2. Has class time been provided to prepare written compilation of findings and reports to the class?
3. Have new problems and possibilities for further study been introduced?
4. Has an evaluation been conducted?

FIELD AIDES

(reference 27)

You already know about "teacher aides," so how about "field aides"?

Why not trained, ecology-minded mothers or dads or other interested people who will go with small groups of your students on short field trips? Another source of "field aides" is your local high school ecology or Biology II class. With the assistance of their teacher, these students are effective leaders and instructors for the younger folks.

A local college biology teacher could provide expert training in field study for your "field aides."

Some activities to use field aides' assistance:

1. A tour of the school at the beginning of the year to get acquainted with "my school environment."
2. Construction of equipment and data boards to be used in the field.
3. In spring, small group soil preparation and garden planting.
4. In winter, work with small groups to make bird feeders.
5. In fall, small groups for planting bulbs, trees, etc.
6. All day field trips to forests, state parks, downtown, farms, fire stations.

Do not forget to include the field aides in planning and setting instructional goals. After the trip, conferences with the aides will help the teacher learn what happened in each group. These experiences can be used in follow-up class discussions and in revising procedures for future trips.

Equipment

Expensive equipment is not necessary—an old log, an eroded area, a shovel to dig a soil profile, some weather equipment, a compass, and things that the students can make themselves. Many good publications are available to assist the teacher. An outdoor lab or nature trail is helpful but not essential.

The environment is there—a far more exciting place than any school, a far more exciting teacher than any person. Why not use it to enhance the learning experiences of children?

CURRICULAR DESIGN

CURRICULAR DESIGN

Each school district should have a curriculum design for accomplishing its goals in environmental education. This design provides a framework around which to organize the total program. It should include an outline of the objectives, suggested activities and strategies for accomplishing them, and a plan for evaluation. A variety of options should be provided to meet the diverse conditions existing in different schools and communities. The program should be tentative, capable of change with changes in society; it should be directed to the needs of the community of students which it serves.

The first step is to determine WHAT should be taught. What concepts, attitudes, behavior patterns, and skills should be developed and in what sequence? For this project, the INDICATORS OF ENVIRONMENTAL LITERACY, compiled by the Education Committee of the Advisory Council, will provide guidelines. (See page 47.)

The second step is to determine the developmental level of the students to be taught and to decide on necessary learning strategies. Once this is done, resources and evaluative instruments must be identified and procured. When developing an environmental education curriculum and infusing it into the existing educational program, several things should be considered. The following format illustrates a working model to facilitate planning. Factors to consider in planning are listed under each PLANNING STAGE. (See page 45.)

TEACHING TECHNIQUES

In an environmental education curriculum, students are encouraged to learn by experience and by their own mistakes, to be independent, and to learn responsibility. It is NOT necessary for the teacher to know all the answers to student questions. Teacher guidance in the investigative processes and a "let's find out" attitude result in more learning than simply supplying information. The teacher's prime obligations are:

1. to provide an environment that challenges student abilities but allows for more success than failure. A changed environment eventually leads to changed behavior.
2. to provide activities that will stimulate discovery and promote development of basic skills, problem solving, and decision making.
3. to serve as a consultant and resource person.
4. to reinforce learning and provide for evaluation.
5. to provide opportunities to examine, investigate, and learn from the real environment.
6. to provide opportunities for values clarification.

A great variety of learning techniques are available to the teacher.

a. Role playing, creative dramatics, and simulation games provide opportunities to experience the feelings related to real-life situations and express ideas about possible action.

b. Debate can cover all sides of an environmental issue and limit the encroachment of instructor or pupil biases. It provides opportunity for decision making and practice in exercising open-mindedness and objectivity. It can make students aware of the many options involved in complex environmental problems and the trade offs that must be considered.

c. Inquiry presents a problem or question. The student gathers data, builds and tests hypotheses, evaluates and interprets results, and comes up with recommendations for solving the problems.

d. Field trips develop observational skills and real-life experiences available just outside the school door.

e. Individual instruction through learning stations, contracts, case studies, school or community projects can be done by individuals or small groups, and can be designed to meet specific needs of the students.

f. Audiovisual aids often provide the question and the motivation for further study and action.

g. Resource persons can have an important impact on student awareness and provide firsthand career education.

PLANNING STAGES

1 LIST EXISTING CONTENT	2 LIST RELEVANT ENVIRONMENTAL PRINCIPLES AND PROBLEMS	3 LIST TEACHING STRATEGIES AND LEARNING ACTIVITIES	4 LIST RESOURCES NEEDED
List existing instructional material relevant to environmental education.	Determine what principles and problems should be added to the content.	Identify environmental encounters appropriate to the content and level of the students.	Use the real world as a learning resource.
Consider a continuous K–12 program.	(use INDICATORS as a guide)	Involve processes of inquiry that promote development of problem-solving and decision-making skills.	List appropriate community resources—people, place, things.
Involve all disciplines.	(consider local conditions and problems)	Involve students in the total learning environment which they can see and understand (e.g., urban, natural, suburban).	List appropriate out-of-school study areas.
		Each environment should demonstrate ecological relationships between man and his environment.	List reference and student materials needed (PATE).
		Don't neglect regional, national, and international issues.	(other)

INDICATORS

OF

ENVIRONMENTAL LITERACY

INDICATORS OF ENVIRONMENTAL LITERACY

The State Board of Education has adopted a formal plan to insure measurable progress for South Carolina's public schools. One of the objectives includes environmental literacy as a part of the educational program for all students. To achieve this goal, certain basic concepts, skills, and attitudes, evidenced by specific behaviors, must become infused into the existing curriculum. This listing of Indicators of Environmental Literacy was developed from recommendations of the South Carolina Advisory Council on Environmental Education after a random sampling of 135 South Carolina citizens.

The Education Committee of the Advisory Council arranged the indicators according to the educational level of students and correlated them with the concepts which form the basis of the *People and Their Environment* learning guides. The *People and Their Environment* series consists of eight guides, developed and written by thirty-four South Carolina teachers, containing lessons for all grade levels. This collection of Indicators may be used to:

describe the environmentally literate student

design units of instruction which involve the environment

assist in the selection of special learning materials and resources

assist in the selection of performance objectives most appropriate to varied subject areas and educational literacy

As stated in the objective, environmental literacy involves knowledge, skills, and attitudes. The knowledge has been organized according to the three basic concepts and twelve subconcepts in *People and Their Environmment.* The skills are those needed by individuals to solve problems and to prevent further environmental degradation. The attitudes should motivate behavior to maintain and improve the quality of the environment and should promote responsible environmental stewardship.

INTERDEPENDENCE

Living things are interdependent on one another and on their environment.

THE ECONOMY OF A REGION DEPENDS ON THE UTILIZATION OF ITS RESOURCES AND TECHNOLOGY.

The student will be able to:

identify natural resources and describe ways in which they are used

identify resources which are in, or are potentially in, short supply

show that the concept of supply and demand determines whether a resource is used wisely or exploited

show that conservation of energy and other resources is an essential step in helping solve present shortages

describe ways that raw and used materials are changed into useable products by people

describe occupations relating to resource use and geography

list effects of increased world population on availability of renewable resources

list areas where needs exist for international cooperation in the utilization of the earth's resources

show a relationship between economic geography and human activities

identify ways by which humans influence the environment for their welfare or ultimate harm

show how industrialization affects the environment

describe urban renewal or town plans for growth and development in your community

describe the role of economy in environmental quality

assess a given area for recreational, aesthetic, and ecological value

list examples of technology devised to improve environmental conditions

list methods used for increasing the productivity of land give examples of appropriate practices for a variety of land problems (e.g., drainage, erosion, slope, etc.)

show that different land areas are suitable for different functions (e.g., agriculture, industry, residence, recreation, etc.)

examine and recognize the effects of human use and misuse of soils

list the minerals of economic importance and identify the general areas of South Carolina where they are located

describe any major abuses of mining in South Carolina and suggest ways to restore a mining area

describe the local process of sewage treatment and compare it with other methods

identify ways of safely disposing of solid waste

describe the local process of garbage disposal as compared with other methods

describe ways of decreasing the amount of garbage accumulated by a family

describe ways of decreasing the misuse of energy for transportation

name major sources of energy

name examples of energy and describe how they are used

name some natural resources that are used for fuel

identify reasons for increased demands for energy and natural resources

describe the processes used in the purification of the local water supply as compared with other methods

identify the major sources of water for a local area

describe the local water system from reservoir to faucet and its return to the environment

identify the principles of watershed management

list economic and ecological values of the ocean

describe how swamps are important to the environment

list major uses and abuses of water in a given area and suggest methods to correct these abuses

list several types and sources of pollution (air, land, noise, water) in the community

list processes used to reduce pollution in the local environment

describe effects of air pollution on plants, animals, and people

list the effects of weather, time of day, and season on air pollution

list methods for controlling air pollution

list the changes in environmental conditions which are responsible for fluctuations in crop yield list economic and ecological values of the salt marsh

compare different practices in conservation, preservation, and management of resources

compare methods of reforestation

describe a forest fire protection program

list major uses of forests and propose methods to correct abuses

THE HISTORY OF A PEOPLE EVOLVES THROUGH INTERACTION OF INDIVIDUALS, GROUPS, CULTURES, AND EVENTS.

The student will be able to:

relate to his environment through his heritage

describe how food production has changed and how the effects change civilization

identify rights, privileges, and responsibilities related to the environment

describe how the use of resources depends on the values of people and their level of technology

describe how climatic conditions, economic factors, and technology have affected the size and spacing of human settlements and life styles of the people

analyze reasons for people moving from one place to another and the effects this may have on life style

describe how cultural values have influenced the human environment

identify areas of the world where overpopulation has caused severe social problems and list some of these problems

describe the effects of natural disasters on the environment and on human life styles

describe how the following changes may affect people in different circumstances: cutting trees, farming, building houses, paving parking lots.

describe the technology used to prevent or control natural disasters and long-term effects of these methods on the ecosystem

describe the relationships between, and effects of, industrial growth, urban growth, and population growth

GOVERNMENT IS AN INTERACTION OF CUSTOM, RULE, AND LAW

The student will be able to:

list local subdivision regulations

use a map to describe the local community and its planned or unplanned growth

list existing and needed local laws designed to protect the environment

identify the local planning commission and describe its duties describe major local community projects designed to result in a more healthful and attractive environment

identify agencies involved in land use planning and list their areas of responsibility

describe how government agencies try to regulate use of some natural resources

identify conflicts which may occur between private land use rights and the maintenance of environmental quality for the general public

list environmental safeguards which should be enforced prior to any major man-made change of environment

identify local, state, and federal agencies that deal with resources and environmental protection

cite major state and federal water pollution control legislation

identify problems that exist between nations because of environmental conditions on land, sea, and air

LIVING THINGS INTERCHANGE MATTER AND ENERGY WITH THE ENVIRONMENT.

The student will be able to:

describe ways in which a given group of organisms (e.g., birds and insects) is economically useful

describe effects of hunting on game animal populations

identify organisms that have been imported to this community or state and the effects they have on the environment

show how humans are dependent upon the biotic environment

give examples of ways that humans are dependent upon soil, directly or indirectly, for food, clothing, and shelter

identify needs essential to man's survival as compared with those of other organisms

compare plant and animal uses and demands for energy with those of humans

design a life style which has a less depleting effect on non-renewable resources than the current U.S. life style

describe the primary energy source in a given community

describe the effects on organisms of variations in the physical environment (e.g., light, temperature, salinity)

describe ways in which solid, liquid, and gaseous wastes affect the quality of the biosphere

list the limiting factors that determine amount and rate of plant growth

show examples of the interdependance of animals on plants as related to oxygen and carbon dioxide

describe and give examples of symbiosis, predator-prey relationship, mutualism, commensalism, and parasitism identify and describe the interrelationship of plants and animals using local examples

construct a food chain and/or web found in an ecosystem (e.g., marsh, mixed forest, pond, field)

distinguish between a healthy pond and a polluted pond by the kinds and number of organisms found in each

describe and contrast a food pyramid, a pyramid of biomass, a pyramid of energy, and a pyramid of numbers

explain what is meant by community

describe a given ecosystem, identifying the major components and niches, producers, consumers, decomposers (e.g., small pond, field, forest)

identify the components for a balanced environment (terrarium, aquarium, local community)

show that increased diversity of organisms in an ecosystem is characteristic of a healthier, more balanced system

identify and describe the habitats of several local organisms

list factors involved in salt marsh formation and explain how they interact

identify ways in which the salt marsh is being destroyed and the effects of each of these on estuarine organisms

HEREDITY AND ENVIRONMENT

Organisms (or populations of organisms) are the product of their heredity and environment.

A LIVING THING IS THE PRODUCT OF ITS HEREDITY AND ENVIRONMENT.

The student will be able to:

- identify common trees and distinguish between deciduous and non-deciduous
- describe the relationship between beaks and feet of birds and the characteristics which help them survive in their habitat
- identify those factors in an environment which affect the growth and development of an organism
- list essential requirements of at least one species of wildlife (include life cycle, food requirements, habitat, or cover)
- describe wildlife and plant populations in a pine monoculture forest as compared to that of a mixed hardwood forest
- identify factors which limit the number and distribution of populations or organisms, including humans
- describe how organisms are able to adapt to environmental conditions
- distinguish between extinction and adaptation
- compare animals of today with those of the prehistoric past
- identify common local plants and animals
- identify some of the diseases and pests that affect our common plants
- protect his or her own body from inner-pollution or self-pollution and recognize the body as the individual's most intimate environment
- list the major ecosystems in South Carolina and their locations

THE BEHAVIOR OF AN INDIVIDUAL STEMS FROM AN INTERACTION OF HEREDITY AND THE PHYSICAL, SOCIAL, AND CULTURAL ENVIRONMENT.

The student will be able to:

recognize that noise is a form of pollution

list some immunizations and explain how they interrelate with the environment

THE CHARACTERISTICS OF GROUPS STEM FROM INTERACTION BETWEEN INDIVIDUALS AND GROUPS.

The student will be able to:

show that some populations of a species undergo dynamic changes

show how biotic communities possess structure and order

identify the major problems caused by overpopulation

explain how territories and pecking orders help to conserve energy and maintain order in a society

describe and explain the territorial behavior of a common, backyard animal (e.g., bluebird)

THE CULTURE OF A GROUP DEVELOPS OUT OF THE INTERACTION OF REGIONAL, BEHAVIORAL, AND ETHNIC FACTORS.

The student will be able to:

describe how environmental factors influence language, literature, music, dance, etc.

identify reasons why large portions of the population are clustered in specific regions

CHANGE

Organisms and environments are in constant change.

THE UNIVERSE IS IN CONSTANT CHANGE.

The student will be able to:

map the weather patterns across the nation and tell how they are related to population distribution

demonstrate knowledge of the orbit of the earth around the sun and the effect this has on earth

describe the present environment as a culmination of change through the years

describe the relationships between tides and the position of the earth and moon

THE EARTH IS IN CONSTANT CHANGE.

The student will be able to:

describe soil formation from rock

describe the physical changes and plant-animal relationships which affect ecological succession

explain how organic matter in soil comes from the decomposition of organisms and relate this to the food web

differentiate between characteristics of various levels of topsoil and subsoil, including permeability and drainage, textures, structures, and consistencies

describe how soil can change and how it can affect the ecosystem and humans

describe how the following change the earth's crust: diastrophism, volcanism, weathering, erosion, glaciation, decay

construct models to explain seasons, day and night, floods, erosion, volcanoes, earthquakes, rain, hurricanes, tornadoes, hail

give some examples of irreversible changes (e.g., mineral depletion) describe how data about present weather conditions can help to predict future weather conditions

describe the effect of ocean currents on the weather

compare and contrast the advantages and disadvantages of stream channelization and of dam building

describe how technology can be used to bring about both beneficial and harmful changes in the environment

demonstrate how pollution can spread over the land, through air, and into water

LIVING THINGS ARE IN CONSTANT CHANGE.

The student will be able to:

describe changes that occur in living things in life cycles, process of maturation, and adaptation

describe environmental changes caused by humans and predict how these changes will affect the organisms in a given area

list evidences to show that as environmental conditions in an area change, the organisms of that area also change

describe physical changes during the life cycle of insects

explain how decomposition occurs and why it is an essential part of the natural cycling process

construct models showing how biological communities progress toward a balanced condition within an environment

name and explain why certain plants and animals in South Carolina have become endangered species and describe ways to help the species survive and increase

describe an example of succession in the local community (e.g., beach, rock, pond, etc.)

WHEN MATTER CHANGES FROM ONE FORM TO ANOTHER, THE TOTAL AMOUNT OF MATTER REMAINS UNCHANGED.

The student will be able to:

list substances which are nonbiodegradable and explain why such substances may be detrimental to the environment

diagram or describe three cycles (carbon, nitrogen, water)

list ways man reuses or recycles resources

list ways of conserving resources which are in short supply

describe energy loss as one proceeds along a food chain

SKILLS

The student will be able to:

describe a use of each of the five senses by identifying and describing shapes, colors, textures, sounds, and odors of natural objects

identify objects by their properties or characteristics

show how objects can be reused or recycled (use of milk carton for growing plants)

construct a classification key

categorize specimens as either plant, animal, protist, or mineral

identify animals in the local environment using appropriate references, keys, and instruments

measure changes in growth of an organism and be able to identify factors that retard or enhance growth rate

use appropriate instruments to measure length, area, volume, weight, temperature, water depth, turbidity, pH, dissolved oxygen, and rate of water flow

distinguish between natural and man-made objects, places, and events

collect information about the habitat of an animal or animals in South Carolina (e.g., optimal temperature and moisture of isopod habitat)

demonstrate skill in care of animals and in construction of micro habitat for a given animal (terrarium or aquarium)

demonstrate skill in recording animal tracks by casting in plaster, photography, or drawings

demonstrate skill in using hand lens and simple microscopes

use a magnetic compass

prepare a simple scale map of an area

gather information to show how a particular environment is being changed by human activity

show that it is important to withhold judgment until valid information is obtained

organize information verbally or graphically so that trends can be determined

collect information from a variety of sources prior to decision making about environmental problems

demonstrate skill in reading and constructing a topographical map or model

Identify a problem in the environment and describe procedures to be used toward answering it, carrying out the procedure, and evaluating the results. Include:

a. identify variables in the study and describe how they are controlled and interrelated

b. demonstrate skill in finding out what to investigate to gain an understanding of the problem

c. demonstrate skill in compiling, recording, and reporting collected information

d. assemble and use appropriate tools and apparatus needed to investigate the problem

e. describe orally, in writing, or non-verbally conclusions about the problem

Demonstrate skill in using random sampling to determine plant and animal population and predicting future impact of population growth. Make predictions from collected data:

a. predict future levels of consumption if unrestricted use of resources continues at present levels

b. predict future conflicts which may arise in the utilization of natural resources

c. predict the need for redistribution of food supplies if the present trends of consumption continue

d predict the effects of an expanding population on such factors as food, waste disposal, living space, transportation, energy, pollution, health, recreation, housing, communication, jobs

e. predict changes in your town 25 years from now

AESTHETIC APPRECIATION

The student demonstrates personal aesthetic appreciation of his environment by:

- responding to beauty and order in the environment
- selecting colors to enhance the appearance of a room
- arranging in a personally pleasing manner a number of natural objects
- expressing feelings about visual and auditory sensations received from order and disorder in a variety of environmental settings
- choosing to demonstrate or exhibit an art form which interprets an environmental experience
- selecting written forms for reading and listening that interpret environmental settings
- describing feelings about a variety of space and object arrangements in a classroom environment
- choosing a favorite musical form to interpret an environmental setting
- selecting favorite natural and man-made environmental settings and describing why they are pleasing
- choosing to interpret a specific environmental experience in an original written form
- identifying patterns in the environment (e.g., leaf arrangement)

ATTITUDE

The student indicates a positive attitude toward his environment by:

recognizing and appreciating the effects of community traditions

recognizing the impact of values on life style

choosing those objects one values and evaluating them as luxuries or necessities

showing how materials in the environment categorized as scraps may be used again to create new products

constructing a set of classroom environmental laws wherein the members of the class set standards to maintain a healthy environment

identifying incidents of waste in the home, school, or community and proposing ways to end or minimize this waste

identifying community laws that govern the use of the environment

cooperating in the improvement of the school, neighborhood, and the community environment

describing the beneficial and harmful aspects of population

showing concern for environmental changes which occur as a result of urban sprawl

recognizing that natural disasters are a part of the natural phenomena of change

not accepting all pollution as necessary or inevitable change

describing his personal feelings about changes in the surrounding locale as a result of population growth

describing situations in which overcrowding affects him or her and the community

collecting information to support or refute advertising (e.g., newspaper, television, periodicals, radio) describing the relationship between uncontrolled population growth and the assurance of a reasonable standard of living for successive generations

choosing an environment for living that one would like from a variety of choices and justifying the choice

showing social responsibility

working to respect and understand cultural differences

showing concern for the needless disturbance of natural habitats

showing concern for the built-in obsolescence of materials

showing willingness to compost biodegradable materials

evaluating the environmental impact of different waste disposal methods

considering environmental impact as a factor in product selection (e.g., voluntarily purchasing and using recycled materials)

supporting reasonable ecological legislation designed to protect and maintain environmental quality

understanding and practicing wise use of food

showing concern for effects of chemical use in agriculture on the animal and human population

identifying the noises in his or her neighborhood that are harmful and suggesting ways to eliminate them

seeking information from agencies which stress the management of resources

participating in school and community activities to improve environmental conditions (e.g., recycling, protecting wildlife, protecting from wild fires and erosion)

showing concern for visual or sound pollution as they affect the aesthetic quality of an environment

choosing from several housing or industrial designs the ones that blend best with a natural area

providing care for plants and animals for which he is responsible

caring for materials in his possession and respecting the possessions of others

choosing to read about or watch programs dealing with environmental conservation

abiding by hunting and fishing regulations

evaluating the effects of his actions on an ecosystem and the natural cycles involved

spending some leisure time enjoying nature

not littering or defacing property

seeking alternative resources to prevent shortages

curtailing personal excessive use of energy and encouraging others to cooperate in conservation of energy and natural resources

evaluating information about the environmental impact of new energy sources and energy producing facilities such as nuclear power plants

attending public hearings of the zoning board or planning commission

developing criteria to evaluate information concerning the environment for decision making

listing reasons why the following are needed: state and national parks, forests, watershed protection, lakes, natural streams, historical sites, camping areas, trails, nature sanctuaries, arboretums

showing interest in relating conservation values to economics, technology, and cultures

STRATEGIES FOR CURRICULUM CHANGE

1. **A Single Course in a Single Discipline**
   An ecology course on the high school level should include environmental problems and principles, inquiry and problem-solving skills, and should emphasize environmental interrelationships. Seventh grade Life Science is often environmentally oriented and includes the impact of people on the environment as well as the impact of the environment on people.

2. **A Single Course—Multidisciplinary (two or more subject areas)**
   This approach may be most easily implemented in a team teaching situation or by an elementary teacher in a self-contained classroom. This course may be problem oriented, combining the natural sciences with social studies, economics, or political science. It may include topics such as pollution, land use and zoning, residential developments, energy. It could be a combination of language arts and social studies in a study of the culture and heritage of a community.

3. **Mini-courses (nine-week single topic)**
   Numerous environmental courses for quinmesters have already been developed by teachers in South Carolina. Among topics for these short courses are survival skills, nature study, photography, pollution, energy use and abuse, population, animal behavior, field ecology. Numerous published mini-courses, usually for high school students, are available.

4. **A Special Unit (see sample—Appendix C)**
   Most teachers are familiar with the structure and format of the teaching unit. This is usually originated by the teacher, adopted from available printed material or adapted. Many units with environmental themes are available from commercial and non-commercial sources. They may consist of a series of activities and classroom projects to a structured series of lessons. They may focus on a single discipline or be interdisciplinary. Teacher-made units often arise from specific needs of students or the community and are geared to available supplies, equipment, and resources.

A good environmental education unit, whether constructed by the teacher or produced commercially, should:

1. develop basic concepts of environmental literacy
2. include use of a variety of instructional strategies — field trips, simulation games, case studies, surveys, learning activity packages and learning stations for individual and small group activity
3. emphasize value clarification as well as environmental content
4. be non-sequential for flexibility of use and placement
5. be written for a range of learning abilities rather than for one grade level
6. include study of natural and man-made environments
7. utilize basic processes for problem solving — observing, using numbers, classifying, inferring, predicting, etc.
8. promote student involvement and activity with and in the environment
9. encourage development of hobbies and skills which may provide life-long enrichment
10. enhance decision-making skills
11. meet needs of students from varied geographic areas, socio-economic levels, and cultural groups
12. expose students to environmental principles

Interdisciplinary units can provide more meaning than units confined to a single discipline. For example, a biology class may be involved in a study of a local stream or river. From their findings they conclude that the water is polluted. Another group of students finds an unpolluted stream. The two groups compare characteristics.

From this study other subjects become involved. The health teacher brings in the findings and relates them to water-born diseases. The social studies class considers legislation on clean water and the steps necessary to alleviate water pollution. The economics class looks into the cost of cleaning up the stream and who is responsible for this cost. The English class writes letters to county or city officials and news articles about the streams. The math class is involved in the measurements taken when the two streams were studied and compared. In this manner all disciplines benefited from the study begun in one, and students benefited from the application of skills in situations which they had identified.

5. Infusion into Existing Units of Study

One teacher or team of teachers can enrich existing course material with local environmental concepts, problems, and activities. Two possible patterns are shown below.

PATTERN A

Concept or Process in Existing Curriculum	Performance Objectives	Learning Strategies	
		small group	individual
example Identification of pollutants, sources, and types of pollution	be able to measure contaminants in air	analysis of particulate matter	interview citizens or monitor air pollution

PATTERN B

ECOS (Ecology, Community Opportunities for Stewardship)

Infusion Process (see sample pages 65–67; also Appendix I)

Using the format shown below, start by picking an area that you are proficient in, that can be used to teach needed skills, and that is part of your existing curriculum.

1. Outline the basic content of your course or unit of study.
2. Examine the list of environmental categories (page 68). Choose three that are compatible with your basic subject content and list them in the column called Infusion Possibilities.
3. Under each of the three environmental categories, list the content that you feel is appropriate.
4. List a minimum of two environmental activities for each category designated in Step 2. Of these ten activities, at least five should be community oriented.
5. List material, place, and people resources necessary.
6. List the kinds of administrative support needed.

PROCESS FORMAT

Content Outline	Possibilities	Activities	Resource Needs		Administrative Support
			Material	People	

An eighth grade Earth Science working model developed by Beaufort County Junior High.

CONTENT OUTLINE

Oceanography

Grade 8

Subject: Earth Science

A. Historical Background
  1. Matthew Maury
  2. H.M.S. Challenger
B. Study of Waves
  1. anatomy
    a. crest
    b. trough
    c. wave length
  2. how waves travel
    a. circlets
  3. effect of wind
    a. fetch
    b. white caps
C. Study of Currents
  1. rip
  2. undertow
  3. longshore
  4. eddies
  5. gyre
D. Tides
  1. cause
  2. length and frequency
  3. effect on wetlands and estuaries
E. Physical Properties of Oceans
  1. salinity
  2. temperature
  3. trace minerals
F. Uses of the Ocean
  1. food/water
  2. transportation

INFUSION POSSIBILITIES (Based on Environmental Categories)	ACTIVITIES
1. Oceans and Estuaries a. How do eddies and tides affect the constructive and destructive diastrophism of marshes? b. What mining and farming can take place in the ocean? c. What effect does harbor dredging have on the ocean and estuaries?	1. Oceans and Estuaries Measure the turbidity, temperature, and salinity of the estuary waters at low tide and high tide. Do this for three areas. Make a chart for all data. Compare. Observe blades of marsh grass in the three areas in one month. Make new observations and compare to the previous data.
2. Transportation a. How much traffic moves on the Intercoastal Waterway that flows past Beaufort? b. Do the cargo ships that call at Beaufort dump waste overboard while in port? c. Does the use of water transportation in Beaufort disturb the local shrimping and fishing industries?	2. Transportation A rotating pair of students with an aide or parent will go to the Beaufort River bank each class period for one week to collect the following information about traffic on the intercoastal waterway. Time sighted, direction of travel, size of boat, motor powered or sail, pleasure or non-pleasure, type of cargo. Information will be totaled. From this a list of questions will be prepared concerning the effect of river transportation on the shrimping and fishing industry. Our local marine science specialist will be invited to the classroom to discuss and answer these questions.
3. Water Pollution a How can we test for phosphate run-off into estuaries? b. What is the city of Beaufort doing about the pollution of the Beaufort River? c. Does Beaufort County's garbage landfill operation disturb the local estuaries?	3. Water Pollution In the upper estuary do the methylene blue Bio Chemical Oxygen Demand test. This test will give the relative degree of biodegradable materials present in the water. Go to upper estuary and collect samples. Clean, empty baby food jars make good collecting bottles. Immerse bottle in the water and fill completely to remove air from the bottle. Back in the classroom pour water from the baby food jar into quart-size mayonnaise jar and shake vigorously for 2 minutes. This dissolves as much oxygen as possible in the water. Place aerated sample in plastic bag. Add one ML or 6 drops of methylene blue solution to the sample. Exclude all air from bag and seal. Label bag with location and date. Place in a dark warm place. Observe the number of days it takes for the sample to shift to colorless. Examine 2 times a day. Rank samples from most biodegradable to least depending on the time it took for change to occur. Make a model of the Beaufort Sewage Treatment Plant. To find the source of pollution of the estuary construct a model of the water shed of that area by using a topographic map. Use a rain bottle to sprinkle water over the model to find the ridge or divide. The divide is an imaginary line that divides the water flow. Mark it on the model. Notice the source of the water flowing into the estuary under study. You have now established suspects of water pollution (those that fall in the water shed and on the drain side of the divide).
4. Energy a. Can we obtain heavy hydrogen for nuclear energy from the Savannah River? b. How can waves and tides produce usable energy? c. How can fuel be made from our marshlands?	4. Energy Make a study of waves by placing a ball into a wave tank, a large aquarium, or the Beaufort River. Notice how the ball bobs in position and only the wave moves forward. If the wind is blowing at the river then one can observe the effects of currents on the ball. Make observations of the tide. Mark the highest tide and the lowest. Measure the difference. After making the above observations on waves, currents, and tides, a classroom discussion should follow as to how man can utilize this energy potential. Have students harvest some marsh grass, horse manure, an old rubber inner tube, and plastic tubing. From this the students can make methane gas in the classroom.
5. Land Use and Misuse a. Should we allow real estate developers to alter wetlands, beaches, and barrier islands? b. How could we best stop beach erosion?	5. Land Use and Misuse (wetlands) Do research on the findings of the state board in regards to the possible effect the Chicago Iron and Bridge Co. will have on the misuse of the wetlands. Compare this information to the information put out by the environmental action committee from Hilton Head. Photograph St. Phillips Island to study its natural defense against erosion. Examine the question: If man develops this island will the natural defense be broken?
6. International a. How far does a country extend its boundary into the ocean? b. Are tides about the same height in England, France, Spain, and Morocco as in Beaufort?	6. International Write the Coast Guard for help in obtaining tide data of other countries so that a comparison to local tide can be made. Research international law concerning countries extending their boundaries into the ocean. Why should tuna fishermen be interested in law of this nature?

RESOURCE NEEDS		ADMINISTRATIVE SUPPORT
Material	People	
Oceans and Estuaries thermometers, balance scales, sample collecting bottles, polaroid camera, poster paper for chart, access to Beaufort River, film: "The Restless Sea" (Bell)		**Oceans and Estuaries** need principal's permission to go to river and conduct tests; need to get film projector from the AV coordinator
Transportation observations, tape recorder, use of telephone, film: "Challenge of the Ocean" (EB)	**Transportation** parents/volunteers, marine scientist to discuss the effect of river transportation on shrimping and fishing industry. Sailors at the marine will be interviewed by students using tape recorder. Also to be interviewed: fishermen, tug boat hands, etc.	**Transportation** need principal's permission to go to river; need equipment from AV coordinator
Water Pollution Methylene blue, empty baby food jars, quart-sized jar, sealable plastic bags, stick-on labels, darkroom (storage), plan/drawing of Beaufort, Treatment Plant, topography map of Beaufort, cardboard, sprinkler top and bottle	**Water Pollution** Wildlife and Marine Resources Comm. for boating assistance, Treatment Plant Supervisor (David Radford) to be interviewed and materials secured	**Water Pollution** Need permission to remove 25 students from classes; need transportation; need substitute teacher
Energy Access to Beaufort River or large aquarium, surveyor's marking sticks, meter measure or 25 ft. tape, marsh grass, horse manure, rubber inner tube, or glass container with sections, plastic tubing, film: "Waves and Energy" (EB)	**Energy** Chemistry teacher to visit and explain the methane gas production (optional)	**Energy** need permission; need equipment from AV coordinator
Land Use and Misuse library for research, current publications, newspapers, ITV What on Earth Series The Sea-Barrier Islands, formation/ecology	**Land Use and Misuse** photographs from State Land Resources Comm. & Coastal Zone Planning & Management Council, Information from the Chicago Iron & Bridge Co.	**Land Use and Misuse** need assistance from librarian; need color television set from AV coordinator
International library for research, film: "Ocean Tides – Bay of Fundy" (EB)	**International** Write Coast Guard for tidal information	**International** need assistance from librarian; need AV equipment from coordinator

Environmental Categories
(developed by ECOS)

Below you will find listed 18 major environmental categories. Scan this list, then on the following pages you will find each of these 18 categories broken down into elements. Examine these elements and after you have done so go back to the first page and check the five categories that interest you most. This process will fulfill step 2 of the infusion process. These are just some possibilities. You may wish to add more.

Major Categories:

___ Air Pollution

___ Chemical and Biological Contamination

___ Energy

___ Environmental Design and Urban Ecology

___ Food and Drugs

___ International

___ Land Use and Misuse (green belts, natural areas)

___ Noise Pollution

___ Non-Renewable Resources

___ Oceans and Estuaries

___ Population Planning and Control

___ Radiological Contamination

___ Renewable Resources – Terrestrial

___ Solid Waste

___ Transportation

___ Water Pollution

___ Weather Modification and Geophysical Change

___ Wildlife

Environmental Categories

1. AIR POLLUTION
   Aspects of:
      aircraft and auto emissions
      emissions from extracting
      refining and manufacturing industries
      electric power generation
      industrial and residential heating
      airborne gases
      particulates
      thermal air pollution
   Sample questions:
      How does the automobile pollute?
      How can we test automobile pollution?
      What factors cause automobiles to pollute?
      How can we measure air pollution in our community?

2. CHEMICAL AND BIOLOGICAL CONTAMINATION
   Aspects of:
      chemicals and biological agents
      chemicals and biological warfare
      plant and animal diseases
      pests
      agricultural chemicals:
         pesticides
         fungicides

- herbicides
- insecticides
- fertilizers
- metal poisoning
- mercury
- lead
- zinc
- detergents
- phosphates
- nitrates

3. ENERGY

Aspects of:

- nuclear and conventional electric power generation
- fission
- hydroelectric facility
- pumped storage chemical
- unconventional:
  - solar
  - geothermal
  - waves and tides

4. ENVIRONMENTAL DESIGN AND URBAN ECOLOGY

Aesthetic aspects of:

- building and landscape architecture
- non-building architecture
- visual pollution:
  - signs
  - billboards
  - transmission lines

5. FOOD AND DRUGS

Impact of environmental problems on food:

- agriculture
- commercial fisheries
- dairy farming
- ranching
- food processing and canning
- harvest expansion and miracle crops
- nutritional requirements
- food poisoning and contamination

6. INTERNATIONAL

International and non U.S. environmental issues:

- pollution and conservation problems
- international cooperation
- United Nations and other world agency programs

7. LAND USE AND MISUSE

Use and abuse of land and wetlands:

- land reclamation
- power and pipeline transmission
- subdivisions
- construction

- stripmining
- planning
- scenic and historic preservation
- open space
- urban and regional planning
- recreational and real estate uses of land, including camping and wilderness

8. NOISE POLLUTION

Sources and effects of noise from:

- aircraft
- vehicles
- railroad and rapid transit
- construction
- explosives
- electronics
- physiological and psychological effects

Sample questions:

- Are automobiles a major source of noise pollution?
- How can we test for noise pollution?
- Can noise from cars be reduced? If so, how and what will it cost?
- What are some effects of noise pollution on living things?
- How can we measure noise pollution in our community?

9. NON-RENEWABLE RESOURCES

Resource aspects of minerals and fossil fuels (coal, petroleum, natural gas)

Sample questions:

- How can we best conserve gasoline? Should we have gas rationing?
- How would a change in the availability of and cost of gasoline affect our life styles in our nation? Our community?

10. OCEANS AND ESTUARIES

Uses and abuses of ocean environment:

- international agreements on seabed use
- technology and programs for exploitation
- ocean mining
- farming
- offshore activities
- oceanography

11. POPULATION PLANNING AND CONTROL

Physical, psychological, and socio-economic aspects of:

- population growth
- incentives and regulations
- birth control techniques
- fertility adjustment
- contraception
- abortion
- sterilization
- death control

12. RADIOLOGICAL CONTAMINATION

Source and effects of atomic and electromagnetic radiation:

- mine accidents
- mine tailings
- seepage

- waste disposal
- fallout
- lab accidents
- reactor accidents
- x-rays
- extra-terrestrial and microwave radiation
- physiological and psychological effects

13. RENEWABLE RESOURCES—TERRESTRIAL

Renewal aspects of:

- water (for pollution aspects see category 16)
- water tables
- watersheds
- water resources
- irrigation
- flood control
- man-made lakes
- channelization water purification
- desalination
- water supply
- limnology (for ocean and marine resources, see category 10)

14. SOLID WASTE

Refuse collection and disposal:

- litter and municipal refuse
- sanitary landfill and waste structures
- compaction and pulverization
- incineration
- water burial
- waste reduction
- package redesign
- recycling and reuse (cryogenic reduction, plasma torch, destructive distillation)

15. TRANSPORTATION

Transportation aspects of:

- motor vehicles and highways
- aircraft and airports
- railroads
- ships
- mass transit
- pipeline transportation
- new systems and concepts
- safety

Sample questions:

- Should we have more mass transportation in our nation? If so, how, where, when?
- How will mass transportation be paid for?
- Does our area need better mass transportation facilities?

16. WATER POLLUTION

Water pollution aspects of:

- industrial
- municipal and agricultural effluents
- thermal
- oil
- chemical

- fertilizer and phosphate eutrophication
- animal wastes
- municipal sewage
- detergents
- dyes
- treatment systems and processes
- limnology
- hydrospheric sciences

17. WEATHER MODIFICATION AND GEOPHYSICAL CHANGE

Geophysical impact of:

- use and misuse of environmental resources
- unintentional and deliberate weather modification
- climate control
- effect of carbon dioxide and particle accumulation
- vapor trails
- reflective effects of oil slicks
- thermal pockets (cities)
- monitoring and sensing techniques
- meteorology and atmospheric sciences

18. WILDLIFE

- fish and wildlife
- game preserves
- wildlife management
- bird sanctuaries
- endangered and vanishing species
- animal habitat
- ichtyology and zoology
- food webs and chemicals

6. Community Action, School Projects, and Case Studies

The Governor's Beautification and Community Improvement Project is just one of many programs in which students and community can participate cooperatively. Students are motivated by the opportunities to make a positive contribution to their community and by the excitement of discovering for one's self. When using the inquiry approach, students are challenged to gather background information on the issues through research and reading. This could take the form of community surveys and interviews. (Should the area be re-zoned for a new industry to provide more jobs? Why don't more people ride the bus to town?)

When students are involved in special projects or case studies, they have the opportunity to investigate the characteristics of their environment and the impact of humans on this environment. They have the opportunity to collect and record data based on their own observations, interpret that data, and act upon their findings.

Guidance in selection and study of environmental projects may be provided by a team of teachers representing different subject areas including the librarian. However, the decision to determine what project or problems to study should be made by the students. Care should be taken to ensure that different student project teams do not make excessive and duplicate demands on community resource persons. At all times students should be helped to distinguish fact from opinion and observation from inference.

After completion of the study, students have an opportunity to communicate their findings through written or oral reports. They will also be challenged to suggest and promote activities for environmental improvement. In this way students become a part of a stewardship process, assuming the responsibility to participate in selecting and successfully carrying out environmental problem-solving activities involving the prevention and resolution of environmental problems.

For successful community action projects, a reciprocal and cooperative relationship between a school and community is essential. Not only can the community supply technical assistance to the school, but the school can provide teachers and students with special skills, the energy, and the desire to make a positive contribution to the welfare of the community. This kind of sharing and cooperation can prove as rewarding to a school as it is to the students involved and the community which benefits from the project.

Possible activities for student involvement will vary from town to town and school to school and may include:

1. monitoring water quality
2. monitoring air quality
3. correcting soil erosion
4. constructing or improving wildlife habitats
5. rehabilitating mining areas, gravel pits or vacant lots
6. preserving historic areas and landmarks
7. developing paths and trails
8. developing recreational areas
9. planning and constructing an adequate drainage system
10. planning and carrying out a litter and solid waste clean up campaign
11. managing a recycling depot
12. managing a pest control program
13. maintaining urban trees and gardens
14. maintaining an environmental information center
15. planning and carrying out a school or community beautification project
16. analyzing an ecosystem
17. monitoring traffic and identifying transportation problems
18. developing and maintaining "vest pocket parks"
19. creating a TV or radio program to highlight local problems and student action
20. identifying community health hazards and possible solutions

COMMUNITY ACTION PROJECTS

Recycling is an area where students can become involved, not only in management and reuse of materials but also in business and management procedures. This project may involve:

a. reuse of paper in the school
b. setting up a recycling depot
c. obtaining and financing trucks to carry materials to the receiving factory
d. making arrangements with the receiving factory as to conditions of the materials and methods of procedure
e. advertising and soliciting public support
f. organizing work teams and designating duties
g. establishing a collection and reuse system in all classrooms
h. monthly newspaper recycling throughout the community by house to house campaign and media promotion
i. managing a home pickup service
j. campaigning to make recycling part of the regular sanitation service
k. lobbying for recycling legislation
l. developing a recycling program for glass and metal as well as paper

SAMPLE
(reference 44)

Project No. 2—Assessing Impact of a Development Project

Discussion—On January 1, 1970, the President signed into law the National Environmental Policy Act (NEPA), which declared a national policy to encourage productive and enjoyable harmony between man and his environment.

NEPA authorized the establishment of a Council on Environmental Quality (CEQ) in the Executive Office of the President. CEQ is charged with responsibility to study the condition of the Nation's environment, to develop new environmental programs and policies, to coordinate the wide array of Federal environmental efforts, to see that all Federal activities take environmental considerations into account, and to assist the President in assessing environmental problems and in determining ways to solve them.

To ensure that environmental amenities and values are given systematic consideration equal to economic and technical consideration in the Federal decision-making process, NEPA requires each Federal agency to prepare an environmental impact statement in advance of each major action, recommendation, or report on legislation that may significantly affect the quality of the human environment. Such actions may include new highway construction, harbor dredging or filling, nuclear power plant construction, large-scale aerial pesticide spraying, river channeling, new jet runways, munition disposal, bridge construction, waste treatment or disposal projects, and more.

This project requires the preparation of a written report. It has been designed to help you learn some of the things planners/developers should consider before implementing a project that could have adverse effects on the environment.

To begin, you must select a development project such as a shopping center, subdivision (housing development), dam, nuclear power plant, airport, industry, etc., in your community or state.

The design of the study and actual format of your report—abstract, statement of the problem (project title and description), etc.—should be determined with your advisor.

Any assessment will begin by examining what planning has been done for the project or proposal under study. For example:

1. What need will this project or activity serve? Has the responsible organization given careful study to this need? (A highway or sewage treatment plant would be built to serve a specific need, while an office building or a housing development might serve to help meet a more general demand for such facilities.)
2. What factors were considered in choosing this type of development, facility, or activity? Were other alternatives considered, and why were they rejected?
3. Why was this site selected? Were other possible locations considered?

In assessing how well this basic planning has been done, it is important to be realistic about the choice of alternatives. Usually it is easier to recognize the problems posed by the specific project you are studying than to foresee what faults or limitations might arise from a different approach or at a different location. Often people in the area affected by a proposed project simply want it built "some place else."

In other cases there may be new technological approaches that have drawn attention for their potential advantages, but are not yet sufficiently proven or not yet available at practical cost for the situation you are studying.

In determining a project's environmental impact, some of the questions you should consider answering in your report are:

1. Will there be a change in air quality during and/or after construction?

2. Will there be a change in water quality during and/or after construction?

3. Will the level of noise change during and after construction?

4. What changes will occur to recreation lands and wildlife habitat?

5. Will any mineral (coal, uranium, etc.) deposits be affected?

6. How will excess excavated materials be disposed of?

7. How will contaminants (radioactive wastes, chemicals, etc.) be stored and all wastes be disposed of after construction?

8. Will there be any change in the water table as a result of the project?

9. How will the land structure be changed?

10. How will human, wildlife, and plant populations be affected?

11. Will there be any aesthetic (visual) deterioration as a result of the project or any odors?

12. Will any rare or endangered species be affected by the project?

13. How will education and health services be changed as a result of the project?

14. How will transportation in the project area be changed during and after construction?

15. Will any legislative changes need to be made—pollution standards or regulations, zoning, ordinances, etc.?

16. Will any historic features or unique wilderness areas be affected by the project?

17. What will be the number and types of new jobs available during and after construction?

18. What changes in population density will occur during and after construction?

19. What changes will occur to the overall economic status of the area?

20. How would the overall "quality of life" be changed as a result of the project? How do the benefits compare with the adverse effects?

Wherever one of these items does raise the possibility of a significant impact, try to determine whether the developer has considered the problem and has made an adequate effort to offset or minimize it. Again, alternatives are examined and their costs compared to their benefits in judging what is a workable way of minimizing each of these impacts.

Once you have answered each of the questions above, in as much detail as your time permits, address the following questions in your report:

21. Are there major effects that have *not* been adequately considered and met by the developer (and by any agencies responsible for approving this project, its land use, or its environmental precautions)?

22. If this is the case, what actions would you recommend to help ensure that the project's major environmental impacts are considered? Include constructive actions which you yourself can take as an individual or as part of an organization concerned with community and environmental improvement.

THE CASE STUDY

A case study involves detailed data collection and interpretation with suggested possible alternative solutions. The case study emphasizes precision and accuracy of data sufficiently valid for use by other groups and agencies. The case study should help mature students in the skills of data collection, decision making, and problem solving. It should also give them an awareness of various points of view and of the complexities of any environmental problem. Essays, news stories, documents, editorials, and student observations may provide the basis for a case study.

Possible topics for case study:

1. Over-land recreational vehicles (ORV's). Snow mobiles, dune buggies, and motorcycles are a multi-million dollar industry providing fun to millions. However, property rights have been disregarded, privacy and wildlife have been disturbed, noise and energy limitations all raise the question of regulations and restrictions. *(reference 31)*
2. Getting to know your community—a group or class activity.
    a. Determine the natural resources in your area—state parks, caves, rock outcroppings, creeks, rivers, marsh, stone quarry, etc. Decide what you want to find out and who to contact for arrangements. Then plan a visit.
    b. Where does your drinking water come from? Visit the water reservoir and trace it to the school. Find out what process it goes through on the way.
    c. Visit the local sewage treatment plant. Find out if the treatment is primary, secondary, or tertiary. In what condition is the effluent discharged and where is it discharged?
    d. To get better acquainted with animals—their behavior, adaptations for eating, moving, and communication—visit the local zoo or pet shop. Try to determine the animals' natural habitats.
    e. Seasons change, and as they do, different flowers become prominent. Arrange a visit to one or more of the local gardens at different seasons to see what is blooming during each season.
    f. Visit a nursery or florist. Find out what country the different plants come from, what climate they grow best in, and what kind of care they require.
    g. Take a city hike. Check the different stone used in buildings and cemetaries. What kinds of plant and animal life do you find in the sidewalk cracks and small parks? What sounds do you hear? What smells are prevalent? Where does the water go when it rains?

Now that you know more about the needs of your community, what can you do to help?

Other topics for case study might include *(references 42 and 44)*:

energy conservation
air quality control
water quality control
solid waste disposal
transportation and land use
coastal development
management of the wetlands
power consumption and distribution
green belts and recreational areas
urban improvement
wildlife management and maintenance
population and land use
organic gardening
recycling

For additional project ideas and assistance in starting environmental clubs, obtain a free copy of the President's Environmental Merit Awards Program from the Information Center, Office of Public Affairs, Environmental Protection Agency, 401 M. St., S.W., Washington, D.C. 20460.

7. Environmental Study Areas for Brief Encounters

The school site and study areas around the school grounds provide many opportunities for brief encounters with the environment. The idea of environmental encounters, developed by Dr. William B. Stapp, includes a series of experiences that focus the attention of students on the ecological and social relationships around them. For example, a sixth-grade class may go outside after a rain to observe and investigate how the water is carried away from the athletic field and play areas. A teacher helping students with readiness skills may provide encounters with leaves of different shapes and sizes, objects that are different in texture, objects that are the same color, and objects with different smells.

The major consideration of these encounters is that they fall into the normal range of challenge for children. They are neither too easy nor too hard, and involve the pupils in the selection and design of the encounter. The informal strand approach, advocated by the National Park Service, interweaves taxonomic classification and open-end research into environmental learning so that students recognize that man and his environment are related to and dependent upon each other. Teachers feel comfortable because they do not need any rigorous scientific background or extensive scientific vocabulary. (See page 120–*The Strand Walk*.)

8. Special Days or Weeks–School Activities and Assembly Programs

Arbor Day–tree planting activities
Wildlife Week–studies of wildlife and extinct species
Earth Week–special environmental awareness programs
Career Week–feature careers that work towards healthful environment
Spring clean-up and fix-up week

Individual teachers can intitiate such projects, or they may be carried on by special interest clubs or individual students after regular school hours or during activity periods.

9. A K–12 Curricular Program

The need is great for environmental education programs which provide instruction for each student at every level of the K–12 structure. Environmental Education can provide connecting links from grade level to grade level. For specific assistance, teachers will find the *People and Their Environment* guides helpful. Many textbook series in both science and social studies are process oriented and will provide additional suggestions for environmental activities.

In the early years the emphasis should be placed on awareness, appreciation, and perception of the immediate surroundings. Primary pupils should not be expected to conduct complex investigations dealing with a number of environmental variables and relationships. However, experiences which help the development of communication skills, esthetic expression, and good human relations will all enhance future environmental activities. Helping the children describe their experiences with greater precision and objectivity and teaching them to measure and classify objects are important processes which can be developed in the early elementary grades.

By the time children have reached the middle to upper elementary grades they are capable of more comprehensive investigations of their environment. In departmentalized schools, teaching teams representing different subject areas can be very helpful in assisting pupils with planning and conducting environmental investigations.

As students mature, understanding and responsibility increase; the scope of studies expands from the neighborhood to global concerns. In high school emphasis is placed on social, political, and economic aspects of environmental problems, options, and their implications on people. At this level environmental studies can be far more complex and exacting. Students could be involved in analysis and monitoring of community water supplies, air monitoring, ecological surveys, and many other activities. Since interests vary greatly, numerous alternatives should be arranged. Role playing and simulation games can help students get a feel for the complexity of the problems.

Some examples of K–12 curricular programs follow, but each school will want to develop its own program.

A SAMPLE K–12 CURRICULAR CONTINUUM

	Health Concepts	Extended Experiences Using the Environment
K–2	Many people assist in keeping the world a healthy place in which to live.	Visit the local health center and arrange for the nurse to explain their services. Plan and organize a clean-up campaign to keep the school ground a healthy place to play and learn.
3–5	The disposal of waste is becoming a critical problem in the community.	Find out from local authorities how the town's waste is disposed of and visit a land-fill area. Determine what products create most waste disposal problems (paper, garbage, plastics, automobiles, etc.). Suggest ways to reduce this waste or reuse it.
6–8	Each individual is responsible for community health.	Take pictures of health hazards around your community and suggest ways that individuals or small groups could help alleviate them. Interview local officials to determine how they contribute to community health.
9–12	Government organizations have a responsibility for the general welfare of the total population.	Investigate wet areas to determine whether they are a breeding place for flies and mosquitoes. Contact the appropriate governmental agency for assistance.

A SAMPLE K–12 CURRICULUM CONTINUUM

	Social Studies Concepts and Skills	Extended Experiences Using the Environment
K	Students should show care and concern for homes, schools, school grounds, streets, parks, and highways in our environment.	Observe differences between a clean and an unclean environment, make litter bags, and help keep school clean.
1	Natural and man-made buildings and areas should be designed and maintained with safety and beauty as first priority.	Observe and construct environmental safety signs (e.g., Smokey).
2	Arbor Day provides opportunities to purify the air, lessen the noise, and beautify and restore the environment.	Plant trees and shrubbery and care for them against fire, disease, and neglect.
3	All places with post offices should be geographically placed on good special purpose maps, and larger cities and ports on physical-political maps. City maps should identify all streets, parks, schools, shopping centers, and churches.	Locate places on maps and give reasons for choices made. (Locate school in the town, railroad, shopping center, etc.)
4	Historic landmarks appropriately restored and/or maintained give attractiveness and tradition to a community.	Visit and become familiar with historical landmarks in the community; on long trips stop at famous ones.
5	A beautiful community can be an inspiring community.	Take pictures and prepare scrapbooks on beauty spots in the community and state. Form a committee to carry out a beautification project.
6	Monuments as tributes to greatness should be erected with enduring qualities and cared for regularly.	Study national and state monuments erected in capitals. Visit some of these monuments.
7	Conservation heroes and specialists should be honored through appropriate communication media on a regular basis.	Serve as a member of a committee to select a Who's Who in Conservation for the State and nation.
8	Areas long neglected should be utilized for recreation, beautified, and maintained with care.	Plan and carry out a project to reclaim an abandoned road or a vacant lot for reforestation or recreational purposes.
9	The improvement of a community sometimes calls for drastic action to remedy sore spots and unsafe conditions.	Visit industrial areas of the community to determine their positive and negative features and make suggestions for improvement.
10	Rivers and streams should be made safe enough for swimming, fishing, and boating.	Take a field trip to a river or stream off the beaten track to determine its ecological importance to people. If possible, take a boat trip to locate both healthy and unhealthy spots.
11	The people in government, national, state, and local, should be informed of our interest in environmental education.	Write letters to the editor and representatives in State and Federal government suggesting and asking for positive remedies to correct ecological deficiencies.
12	Students should acquire skills in land and water use.	Design a long term plan for improvement of the State's environment, especially for areas with which you are most familiar.

A SAMPLE K–12 CURRICULAR CONTINUUM

	Science Concepts and Skills	Extended Experiences Using the Environment
K	Observation skills—plants and animals are renewable resources.	School yard walks and games can enhance perceptual skills, space relationships, and use of senses for outdoor observation.
1	Classification skills—living things change.	Check temperature; observe changes in insect life cycle and in color of leaves around school and in neighborhood.
2	Measurement skills—living things are interdependent with one another and with their environment.	School yard encounters help observers to see what animals eat; set up and observe bird feeders. What animals eat what food?
3	Interpretation of data—plants and animals can increase in number if they have an appropriate habitat.	Establish a bird habitat in a corner of the school yard; observe places where insects, squirrels, and people live.
4	Predicting—people obtain energy from food; State and Community agencies assure clean food and water.	Take a field trip to Main Street to note the kinds of services provided for careers in science fields.
5	Hypothesizing and evaluating—water is essential for life.	Find out where the school water comes from, where it goes. Visit a water treatment plant.
6	Design and analysis—natural resources are unequally distributed and some are finite.	Unnecessary packaging—what happens to the things I throw away? Learn about natural resources, garbage inventory.
7	Investigation skills (including all of the above)—ecological components are interrelated; pollution size depends on several factors including availability of food and number of predators.	Make population studies of plants on the school ground or animals in the neighborhood.
8	The earth constantly changes.	Make weather observations including long-range data keeping and predicting—soil testing and field trip to observe erosion and land use.
9	Matter and energy change from one form to another.	Take a field trip to an electric generation plant.
10	Problem-solving skills in which all skills are applied—people have individual and collective responsibility for maintenance of a healthful environment.	Survey an ecological system to determine best land use or condition of water quality.
11	Chemical changes affect the quality of water and air.	Participate in Youth Conservation Corp and peer teaching, and study water and air pollution and food additives.
12	Energy is lost when changed from one form to another.	Make research and field studies of land use, wildlife management, transportation, solar or wind as a source of energy, and other community problems.

POSSIBLE SCOPE AND SEQUENCE FOR ENVIRONMENTAL EDUCATION CURRICULUM

(reference 37)

Topics	Water	Air and Noise	Land Use
Grades K	Why is water important? Uses of water.	Why is land important? What sounds do we hear at home and at school?	What do we use land for (i.e., housing, industry, recreation, agriculture)?
1st	How is precipitation a source of water?	What do we find in the air? What pleasant and unpleasant noises and smells are in the air?	How does the type of land influence your backyard?
2nd	What is the water cycle? Home uses of water.	What are some simple pollutants in the air? Can you chart the degrees of pleasant and unpleasant noises that you hear?	How does the type of land influence the type of community that we live in?
3rd	What are the salt and fresh types of water forms (lakes, ponds)? What types are in our community?	What are some local sources of air pollution? Can you measure the noises that you hear?	How has man adapted his life to the type of land form?
4th	What lives in the various water forms?	How does air pollution affect man and other animals and plants? What effect does noise have on man and wildlife?	Natural changes such as weather and erosion.
5th	What are some of the abuses of water in our local community and in our state?	How does man pollute the air in our local community and in our state? Testing and remediation.	What has man done to change or abuse the land in our local community and in our state?
6th	What are some of the abuses of water in the world? U.S.? Testings and remediations in the world and in the U.S.	How does man pollute the air in the U.S. and in other parts of the world? Testing and remediation.	What has man done to change or abuse the land in the U.S. and in other parts of the world?

POSSIBLE SCOPE AND SEQUENCE FOR ENVIRONMENTAL EDUCATION CURRICULUM

(reference 37)

Topics	Energy and Recycling	Wildlife and Plants	Health
Grades			
K	What gives our bodies energy (food)? Basic recycling in relation to art.	Besides man, what else lives on earth? Discuss local air, land, and water animals.	The importance of personal cleanliness.
1st	How do we use energy in our homes (fuel, electric)? What do we save and what do we throw away?	Besides man, what local plants grow in our community? Discuss land and water plants in our community.	Nutrition and balanced meals.
2nd	How do we use energy at school and what can we do to reduce or conserve energy?	What are the interrelationships between plants and animals? Discuss the food chain.	Senses. How do our senses help us to know our environment?
3rd	What are the sources of energy? Trace the sources from the natural resources to land use.	How does our local community's use of air, water, and land affect our plants & animals?	Examination of the sources of disease.
4th	How is some fuel formed? How is it formed and processed?	Extinction and dangers of extinction of species in the U.S. Exploitation.	Proper foods and their effect on growth. Body defenses against diseases.
5th	How do we waste energy and natural resources in our community and in our state? What can we do to conserve energy and our natural resources?	What has been done about conservation and the preservation of wildlife and plants?	Systems of the human body. How does the environment affect the systems of the body?
6th	How do we waste energy and natural resources in the U.S. and in other parts of the world? What can we do to conserve energy and other natural resources?	Eco-systems. What is a balanced environment?	Human body: environment, nutrition, medicine, drugs, population explosion, public health.

There are basically two approaches to environmental education:

1. Environmental education uses the skills and information of various disciplines.
2. Each discipline can use environmental activities to teach the knowledge and skills of that discipline.

1. First Approach: Environmental Education Uses the Skills and Information of Various Disciplines

The complex problems of the environment require a comprehensive interdisciplinary approach and concerted effort by all subject specialists. Experts in the disciplines must be capable of communicating and working with each other and be able to visualize the whole as clearly as they see the parts.

Students, to be adequately prepared to deal with environmental questions, need some educational experiences that include a combination of subject areas. For example, water pollution may involve biology, chemistry, economics, government regulations, as well as community attitudes and values. To be fully understood, it cannot be restricted to a single discipline.

Recognizing this need, the editors of educational journals from seven leading disciplines made the following statement in February 1975 in *The Science Teacher*:

> We declare that all aspects of environmental problems are the joint responsibility of all of us; developing the motivation to cope, gathering and interrelating pertinent information, making value judgments about action to be taken, and implementing the decisions. We dedicate our cooperative efforts as educators to increasing our own and our students' understanding of the complexity of contemporary problems, and we accept, and encourage others to accept, the responsibilities for restoring and preserving our natural and social environment. The situation demands an interdisciplinary approach to environmental education.

Most school curricula are usually made up of specialized bits and pieces. The food scraps disposed of in home economics class are never the chemicals that fertilize plants in chemistry. The food that is prepared is not related to the geography where it is grown or the economy of the region. Legislated regulations and procedures remain in the social studies class and are not applied to food additives in health or nuclear power plants in science. If education is to be relevant and meaningful, subject areas must collaborate, integrate, coordinate, and ultimately translate their efforts into beneficial action.

One way of accomplishing this interdisciplinary approach is through team teaching. A team of teachers can work together on a unit with each discipline listing its own objectives. This example was developed by a team from E. L. Wright Middle School, Columbia, South Carolina.

Interdisciplinary Approach through Team Teaching
(Sample from E. L. Wright Middle School,
Columbia, South Carolina)

Objectives

SCIENCE	SOCIAL STUDIES	MATH	READING AND LANGUAGE
Study the environmental problems existing in Dentsville (e.g., solid waste and pollution).	Collect facts on the history of Dentsville. Interview town officials.	Make graph on the growth progress in Dentsville. Make graph showing the number of people and their growth.	Write report on the history of the town. Make a list of questions to ask on interview of town officials.
Count number of cars passing during a certain time of day. Make a survey of students who walk to school using Alpine Road.		Make graph of traffic pattern. Make people path charts.	
Study geological background. Study plant and animal life. Tour and study the nature trail.	Study history of Sesqui (e.g., why, when, land purchase).	Determine use of fire tower to community. Find out height of the fire tower.	Devise activities to find out how the community and industry use Sesqui.
Study geological background of Wright. Develop outdoor classrooms. Observe erosion on campus and suggest ways of correcting it.	Study history of E. L. Wright. Make map showing layout of campus.	Measure areas on campus in which landscaping will be done.	Make plan of possible landscaping that could be done on campus.

SAMPLE INTERDISCIPLINARY CLASS ACTIVITIES

(all should be followed up with questions and discussion)

1. Establish an air monitoring station at the school and in other local areas. Prepare graphs and data sheets to illustrate the findings.
2. Invite someone from your town government to talk with the class about methods used to treat sewage and dispose of waste products.
3. Examine contents of classroom wastebasket. How can we minimize waste?
4. Survey waste disposal at home. How much and what kind of material is discarded each day? How can you minimize waste at home?
5. Survey street litter (assign each group to a different street). Where is litter greatest? What kind of litter is most common?
6. Turn over wastebasket in the school hall and record verbally or with picture the reactions and behavior of people who pass the large mess.
7. Shop with your families and record all evidence of waste in food packaging and merchandising by weight and product. (Out of 10 lbs. of groceries, how much weight is in packaging?)

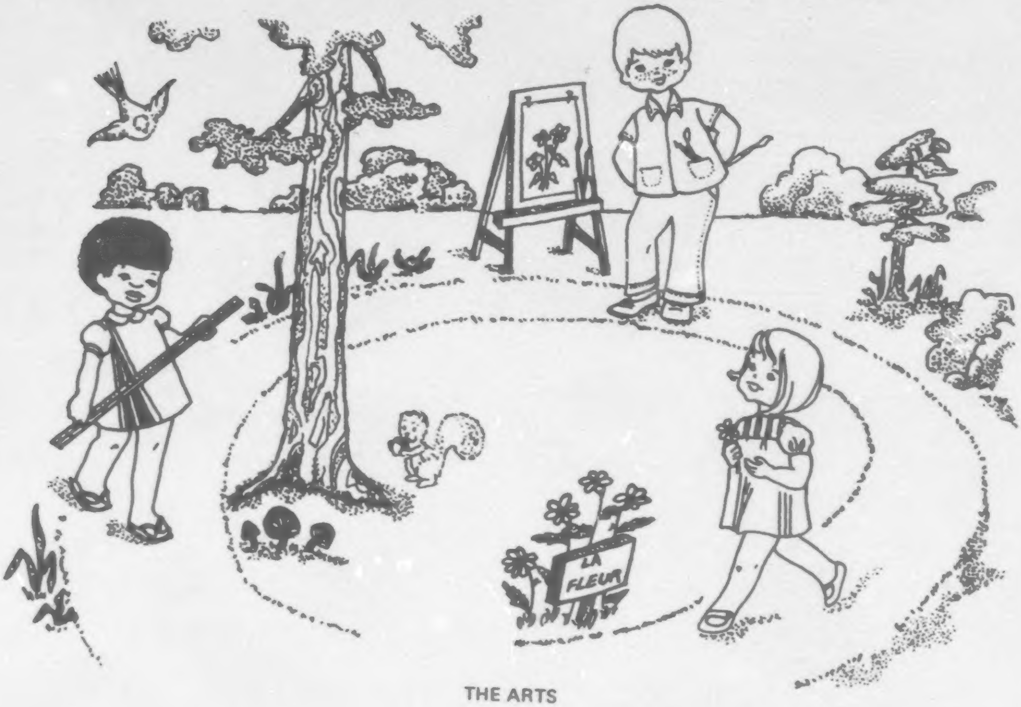
The First Law of Ecology:
Everything Is Connected to Everything Else.
The Second Law of Ecology:
Everything Must Go Somewhere.
The Third Law of Ecology:
Nature Knows Best.
The Fourth Law of Ecology:
There Is No Such Thing as a Free Lunch.

DR. BARRY COMMONER
The Closing Circle, 1971

8. Study the possibility of recycling paper used at the school and using it again.
9. Prepare a report which indicates the present amount of water used in your town. Interview a town planner and water treatment plant manager. Discuss and project the water needs for your town 20 years from now.
10. On a map of your town, trace the sources of water supply and the flow patterns.
11. Develop a topographical map indicating the areas of extensive paving and water runoff in your town.
12. Examine used furnace filters or air conditioner filters to determine the quantity and size distribution of particles found in household air.
13. Invite a representative from the local health department to speak about construction and function of septic systems for rural homes.
14. Make a thorough study of your school grounds and suggest esthetic, energy saving, and other desirable improvements.
15. Determine the availability and need for mass transit as an alternative to individual cars and as an aid to the elderly and handicapped.
16. Make a mini-landfill and examine and record changes each week.
17. Determine the amount of sediment in different water samples taken from streams and drainage ditches throughout the community.
18. Determine the number of cars usually parked in the school parking lot. Estimate the amount of gasoline saved if car pools and buses were used.
19. Locate your city or county dumps and determine if they are in watershed areas.
20. Determine what agencies, governmental groups, and citizen groups promote a healthy environment.
21. List changes in personal and class practices that would reduce use and waste of consumables.
22. Construct a compost pile and use it to fertilize the garden areas of the school property.
23. Discuss with local officials the town's source of water, electricity, and fuel.
24. Discuss with local officials the town's method of trash and garbage disposal and sewage treatment.
25. Design an instrument for determining the quality and quantity of particulate contamination of air and survey air contaminants in different parts of town.
26. Invite industrialists to the class to discuss their antipollution measures.
27. Recycle animal fats by making soap.
28. Construct and install bird feeders, bird houses, and brush pile cover for animals on the school grounds, preferably where they may be observed from the classroom window.
29. Using a Burlese apparatus, take a census of soil organisms and determine their effect on soil.
30. Estimate the percentage of land in your town or city which is devoted to the following categories. Record results on soil or topographical maps to determine possible relationships.
    a. schools
    b. roads and paved parking areas
    c. rivers, streams, and ponds
    d. woodland
    e. parks and recreation areas
    f. industry
    g. business
    h. residential housing
    i. farming
31. Build a weather station and keep a weather chart. Compare your data with the weather report in the newspaper.
32. Make a study of the laws and controls for cats, dogs, etc. This study might include a report by someone from the Humane Society or by a dog catcher or veterinarian.
33. Plan and organize a court presentation of a case (John Q. Public vs. the Land Developer who is bulldozing the sand dunes).
34. Collect, measure, and tabulate the amount of visible solids from the exhaust systems of the following kinds of automobiles:
    a. foreign and American new cars
    b. cars five years old, ten years old, or older compared with new cars of the same company
    c. tuned versus untuned cars of the same make and year
    d. cars with pollution devices versus cars without pollution devices—check different kinds of pollution devices
    e. differences among cars with 4, 6, and 8 cylinders

2. Second Approach:
Each Discipline Can Use Environmental Activities to Teach the Knowledge and Skills of the Discipline

Since environmental education can be integrated into each area of classroom instruction, activities in this section are grouped in relationship to the subject matter of the various disciplines. After reviewing the activities in a given subject area, the teacher can adapt or select those which best fit into the instructional program.



THE ARTS

Art

Man uses art to understand himself and the world around him, both when he produces works of art and when he contemplates them. The visual arts continue to be a means whereby man attempts to give form to his ideas and feelings and to gain personal satisfaction through individual accomplishment. The growing complexity of our contemporary culture, including its visual aspects, requires of every individual a capacity for visual discrimination and judgment.

At each level of the art program, experiences should be selected and organized to broaden understanding in all four aspects of the subject: perceiving, performing, appreciating, and criticizing. The environment can provide a multitude of materials and opportunities for students to grow in these four areas.

Perceiving

Perception sensitizes students to the world about them. It enables them to see, feel, and comprehend form, color, and texture as well as subtleties in their daily experiences. Through the development of heightened perception, individuals come to value, use, and derive pleasure through the faculties of sight and touch.

1. Collect objects of various colors, shapes, and textures from your school yard.
2. Fold, feel, and describe forms that have interesting visual and tactile qualities (e.g., seeds, stones, fibers, man-made objects).
3. Describe implied visual movements (e.g., the direction of a tree limb, the sweep of clouds, the thrust of a mountain).
4. Depict three-dimensional qualities indicated by overlapping planes, vertical position, size and color of intensity.
5. Perceive and describe objects from various points of view (e.g., from below, above, inside, or outside on a field trip or around the school building).

Performing

Expression is cultivated through direct personal experiences with art media and involves those skills that enable students to communicate ideas, images, symbols, spirit, and feelings in visual forms.

1. Engage in creative drawing, painting, modeling, constructing, or printmaking using natural materials (e.g., dyes, fibers, discarded items).
2. Produce an imaginative work of art, such as an animal or building that looks like no other object has looked before.
3. Produce an art work that has particular feeling such as coolness, loneliness, warmness, or wetness.
4. Modify the form of an object (telephone, building, can, cloths) to improve its aesthetic quality or functional character.
5. Demonstrate the ability to represent spatial conception (one person standing in front of another, something close and something far, a street and a building, a tree and a mountain).

Appreciating

1. Describe uses of the visual arts in today's world, involving the popular media of advertising, television, and film.
2. Determine and describe the place of art and artists in society and in the local community.
3. Find examples of the variety of art forms used in local business and industry, including environmental design, product design, technical illustration, TV and film, fashion design, and fabric production.
4. Describe the interrelationships of economic, social, political, and religious conditions with the form and content of selected works of art.
5. Describe how major artistic concerns and contemporary movements in art represent social, political, environmental, and cultural conditions and how they affect the quality of contemporary life.

Criticizing

Aesthetic judgment involves the study of the visual, intellectual, and philosophical bases for understanding art and for making judgments about its form, content, technique, and purpose. Students come to understand issues and to develop criteria for appraising visual forms and forming personal preferences and opinions.

1. Find illustrations of the effects of design quality on the function of products and environments using materials on the school ground and in the building.
2. Compare and describe buildings or places in your environment with respect to their aesthetic meaning, sensory qualities, style, and the materials and processes necessary to create them.
3. Judge a utilitarian object in your environment—an advertisement, building—on the basis of how well it functions or fits a context.
4. Identify strengths and weaknesses in the quality of the visual environment of the school playground.
5. Analyze and propose possible solutions for aesthetic deficiencies in the community, home, or school.

Drama

The essence of drama lies in a twofold action: consciously assuming an identity other than one's own and accepting others in the identities which they choose to assume. It is one of the ways through which people have explored their worlds, real or imaginary, and their roles in those worlds. Drama allows the safe exploration of roles and relationships outside of reality as well as in real life situations. The simple expression "let's pretend" is a way of learning how farmers feel about land development, how caterpillars move, or how feelings can be communicated through facial expression or body movement. Suggested activities include:

1. Make up a fable about an animal and act it out for the class.
2. Compose a story about the living things in a pond community, then let other classmates add to the story bit by bit.
3. Construct a simple puppet theater; make puppets out of objects found on the school ground and put on a brief show.
4. Use a tape recorder to record sounds in the environment that could be used as part of a skit or play.
5. Act out the discovery of startling personal news leading to excitement, embarrassment, or tragedy based on an environmental happening.
6. Locate places on the school ground and in the community where various types of dramatic performances could be produced.
7. Go outside and find samples of materials that could be used in building sets.
8. Take pictures of various places in the community to serve as a reference for flats.
9. Describe the kind of environment needed for the set of a play about pioneers in South Carolina.
10. Collect pictures of people of different ages and nationalities for reference in creating makeup and costumes.

Music

Sounds are often ignored parts of our environment, yet they can have a major, basic effect on life and living. How do we react to these sounds of our environment? Which sounds are happy? Sad? How does the voice make sounds? What sounds are made by instruments? What sounds are music? Noise? What are the dangers of noise?

People have received inspiration from the sounds in their natural environment. Probably primitive instruments were developed from natural materials as a result of human interaction with the environment. The out-of-doors can become a friendly, informal environment to enjoy the sounds of nature or engage in folk song and dance. It can also become an amphitheater for operettas, band concerts, and other formal productions. The environment can provide a source of materials and learning experiences to enhance the music program. Some possible activities include:

1. Bean rhythm: put beans, rice, or rocks in tin cans or cardboard boxes and shake them to make various rhythms.
2. Rock rhythm: select rocks large enough to hold in your hand and strike them together or on other surfaces (e.g., a log, the ground) to explore vibrations and sound.
3. Produce sounds by rubbing sticks, nails, or other objects across textured cardboard surfaces to produce sounds.
4. Cut pieces of bamboo into different lengths and stick them together to produce sounds of varying pitch.
5. Make a long, hollow tube of clay formed around newspaper which will burn out in a kiln. Punch out holes for desired pitch and play your flute.
6. Fill bottles with water, placing a different amount of water in each bottle. Arrange in order of pitch and play a musical tune.
7. Attach sandpaper to blocks of wood and rub them together to produce interesting sounds and rhythms.
8. Using various sized boxes, strike the sides of these boxes with spoons or other solid objects to get pitches. Play a tune.
9. Design an instrument to produce sound using wire, string, rubber bands, or other material stretched across a wooden box or frame.
10. Record sounds produced by water striking different surfaces.
11. Record and analyze sounds in the community. Discuss what could be done to reduce unpleasant and disturbing sounds.

12. Record the rhythmic patterns of bird calls.
13. Listen to footsteps on various surfaces and compare them to different musical instruments.
14. Learn some camping songs to be sung around a camp fire and teach them to the class.
15. Tape-record sounds of nature and use them to construct a musical composition.
16. Listen to the natural sounds of water. Reproduce these for the class with musical instruments.

FOREIGN LANGUAGES

Environmental concerns can provide greater understanding of foreign countries and can reinforce vocabulary and structure through dialogues, word activities, and debates. Some suggested activities for the foreign language class include:

1. Take a nature walk in the target language, using appropriate vocabulary.
2. Write ten rules for ecology awareness in the target language.
3. Write a short paper or paragraph on "The Ideal Ecological Environment for Me."
4. Organize and present an oral debate in the target language on some ecological issue (e.g., offshore drilling, the energy crisis).
5. Use activities in the culture packs on environmental education (done in Spanish, in French, in German) available from your Foreign Language Consultant.
6. Find, read, and report on ecology-related topics in current newspapers and magazines from the target country.
7. Invite foreign language resource people to talk about pertinent environmental topics in their own country. Later, students may discuss attitudes reflected in what the resource people said.
8. After a film or filmstrip of the target country, deduce what environmental problems either exist now or will soon become important.
9. Discuss points of view (e.g., overpopulation as an issue in the Hispanic world; pollution on the French Riviera).
10. Examine reasons for colonial expansion from the ecological point of view; discuss reasons for colonial resentment from this point of view.
11. Take two similar geographical regions and compare environmental problems, treatments, needs (e.g., the northern desert of Chile and the desert around Palm Springs; Alsace-Lorraine and West Virginia; Congaree swamp and Nicaraguan swamp; French Riviera and Myrtle Beach; Swiss mountains and Smoky mountains). Discuss obstacles to their development; obstacles to their preservation; economic value vs. natural value; treatment and condition to date.
12. Compare points of view regarding overpopulation, energy conservation, urban sprawl, and pollution as reflected in current articles, current literature, or a film.
13. Present some environmental project of the target country and let students think of where or how it might apply to South Carolina or the United States.
14. Discuss points of view on issues that involve environment and foreign relations.
15. Discuss points of view on the ocean; who owns it?
16. Discuss points of view on nationalizing natural resource industries and on the interdependence between nations.

HEALTH

Health is one of the primary concerns in the effort to make the environment cleaner and more livable for human beings. In their efforts for "more," "bigger," and "better," people have caused an imbalance in the environment which has affected their health and welfare. Pollution is one of these products which is detrimental to the quality of life. Environmental education can have a favorable impact upon the quality of life and health of all earth's creatures. Anyone engaged in the manipulation of the environment is involved in the manipulation of people's health.

No one can be removed from the environment, thereby making "man and his environment" one interdependent unit until the end of time. Activities such as hiking, swimming, cleaning up a polluted area, and following a nature trail are important to the degree of impact that the action has on the quality of life of each individual.

Suggested activities to help students understand the impact of the environment on individual and community health include:

1. Plan an outdoor menu using native plants. Note which essential nutrients come from each plant.
2. Find hazards in your environment and suggest ways to remove them.
3. Collect pictures of dangerous animals and suggest precautions to take when visiting their environment and remedies to use if harmed by one.
4. Demonstrate good techniques for water safety.
5. Construct a simple first aid kit that you could use on a field trip.
6. Make a collage of the various products that now create waste disposal problems.
7. Check the temperature, humidity, and wind outside the school each day for one week and compare with a survey of students' general feelings of well-being each day.
8. Visit the local dump or sewage disposal plant to see if the community has a disposal problem.
9. Plan a school-community "clean-up" project to involve as many individuals as possible.
10. Decorate litter containers and encourage their use.
11. Collect pictures of disease-causing insects and describe ways of preventing these diseases.
12. Find out about rats and mice—where they live, what they eat. Suggest ways to control them in your neighborhood without using dangerous chemical poisons.
13. Make a diagram showing the main elements of your ecosystem—air, soil, water, plants, animals. Draw arrows from one to another showing how they are interdependent.
14. Visit a water treatment center to see how your water is treated to protect your health.
15. Visit the local Environmental Protection Agency officer and find out how to test well water samples to determine safety. Organize a team of trained students to test well water for people in your community.
16. On your way to school or to town, determine all sources of noise pollution. How can noise be reduced?
17. Develop a list of harmless methods for controlling pests and plant diseases.
18. Find out what local laws exist for controlling pollution and community health.
19. Tour your neighborhood and determine the causes of air pollution.
20. Go outside and find sounds that are happy, sad, angry, and frightening.
21. Show how overcrowding can be harmful to health.
22. Take pictures of local sources of pollution and identify the causes and possible methods to reduce them.

LANGUAGE ARTS

The only place a person can live is in the language that he knows. In a very basic way, the best language lesson is one which expands and enriches the student's communication with his world. Who he is, where he is, why he is—these are the ultimate questions with which education is concerned, and language is the primary vehicle for its processes and principles.

The complete language program involves the student in two areas: the skills and the arts of language. The former provide tools and the latter provide understanding. Both constitute the student's inner and outer environment by defining who he is, where he is, and, ultimately, why he is. Since the inner realm of the individual's feelings and beliefs are his personal province, the most practical and effective place for the teacher to start his language instruction is the physical environment—the teeming imbroglio of sights and sounds, of touch and taste and smell. It is here that the student can grow in both his competence and confidence in communicating with his world through enriched involvement in speaking, writing, reading, and listening.

Some of the most exciting language arts activities resulting from outdoor experiences are creative writing and oral expression. Descriptive writing and the desire to share experiences through various modes of communication can be the beginning of linguistic creativity as well as a means to reinforce basic concepts and skills.

In the classroom, it is probably best to "start small." Teach the student to observe the details of his immediate environment, starting with himself. What is he made of? Any elements that don't occur anywhere else? What about his clothing, his shoes—natural or man-made materials? And what about this thing called "the balance of nature"—is the life he is making for himself helping to maintain it, restore it, destroy it?

From his own personal environment, the student can then be led to think in broader terms. How is his community today different from what it was ten years ago? A hundred years ago? Would smoke from a population of 10,000 chimneys have a better or worse effect on the environment than a hydroelectric generator to heat that many homes electrically?

Such general considerations can be used in many ways to bring the student to an acute awareness of his place in the ecological balance of man and his world. Independent research projects at home or in the library, group work, panel discussions, special reports and presentations, and general discussions can heighten awareness. It is recommended that no classroom approach be used at the expense of all the others. Clear communication is the primary objective, so keep the student busy reading, writing, listening, and speaking about his environment.

Below are suggestions which might serve as a point of departure for further planning. As a bench mark for such activities, consider them to be successful if the student can say upon completion, "It was about me."

1. Take a walk around your school and write a brief poem or paragraph to describe something that makes an impression on you but which others would probably miss.
2. Organize and participate in an ecology drive at your school to clean up pollution, waste, refuse, etc.
3. Instigate an "Arbor Day" or "Earth Day" or "Mother Nature Day" observance at your school, landscaping the campus, planting shrubbery, flowers, etc.
4. List the wildlife (birds, mammals, reptiles, etc.) common to your area and keep a checklist of those observed. Which is the rarest animal? Which is the rarest bird?
5. Choose one aspect of environmental problems and use pictures, headlines, and similar illustrations clipped from publications to design a collage.
6. Consider modern housing: compare and contrast mobile homes and teepees, split-level suburban subdivisions and cave dwellings. What "side effects" of housing developments would make a difference on the environment (sewage, water, electricity, paving, trees and wildlife, soil erosion, etc.)?
7. Design your own house and its environment. Present this to the class and justify every room, every part of it.
8. From the Sunday newspaper, clip a description of the "house for sale" you would choose if you had the money.
9. Discuss the advantages and disadvantages of city versus country living.
10. As an individual assignment, research the causes for such vanishing wildlife on earth as the tiger, the blue whale, the penguin, the American alligator, and the crocodile.
11. Plan a "recycling day" at your school, including posters, handbills and advertisements, news stories for radio and television.
12. Write poems, short stories, plays, or essays depicting life in the year A.D. 2000.
13. Have a contest to design an "ecology flag."
14. Write an editorial or a letter to the editor of your local newspaper to discuss a particular aspect of the environment which deserves public attention.
15. List all the things thrown away by everyone in the class today (candy wrapper, gum, milk cartons, soft drink cans, paper, etc.); then discuss what happens to all this, where it goes, and whether the use/waste cycle is a balanced one for the environment as a whole.

Free rental films available from the State Audiovisual Library include:
"Problems of Conservation"
"The Aging of Lakes"
"Air Pollution"
"Population Explosion"
"Boomsville"
"The Garbage Explosion"
"Problems of Conservation: Air"
"Problems of Conservation: Water"
"Problems of Conservation: Our Natural Resources"
"Air Pollution: Take a Deep Deadly Breath"
"Air Pollution"
"Pigs"

MATHEMATICS

The main thrust of contemporary mathematics programs is the development of logical reasoning, problem solving, and computational skills. Mathematics can also be used to explore and provide enlightening information concerning use and conservation of our natural resources. Calculations can indeed give us information that dictates the curtailing or expanding of certain practices that influence the environment. Mathematics used in this manner can serve as meaningful practice of learned concepts and skills. A few examples of activities that utilize mathematics and contribute valuable information are listed below:

1. Determine the number of hectares of land that have been covered by the interstate highway system in South Carolina (including or excluding right-of-way as desired).
2. Determine the amount of water used to brush teeth with the faucet running moderately during a three-minute brush time. Compare this amount with the amount of water used when turned on and off as needed.
3. Study a special tree. Determine height, diameter, circumference, branch spread, height of lowest limb, number of leaves or needles on a branch, area of its shadow, and so forth.
4. Pick up litter from a particular area. Classify the litter in terms of metal, natural fiber, or synthetics. Determine the total weight, total number of pieces, and the total area canvassed.
5. Determine the weight of an inch of rainfall on an area that has some special meaning to the student or class.
6. Determine the number of students who return a reasonable amount of food on their tray during a particular lunch period. Classify the food as meat, vegetable, liquid, or others and report your results to the cafeteria manager.
7. Determine the weight of a daily newspaper. Determine the total weight of the circulation for the day. Use this as the average weight and determine the amount of paper used for a week, month, or year. Translate into the number of trees needed to produce this amount of newsprint.
8. Invent an instrument for measuring land area and measure the playground, baseball field, and other areas of the school ground.
9. Using a compass, locate various features of the school ground (flag pole, large tree, etc.).
10. Measure your classroom. How does the area of the classroom compare with the area of your living room at home? With the corridor of the school? With the library? With the cafeteria? With other classrooms?
11. Using meter sticks and a bicycle wheel, measure the length and breadth of sidewalks, paved playground areas, parking space, and the school roof. Using this information and adding it to the knowledge of average annual rainfall in your area, compute the amount of rainfall run-off provided by each of the areas impervious to rainwater.
12. Determine the geometric growth of a population of mice, flies, mosquitoes, or bacteria.
13. Graph the data from a random sampling of plant populations in the school yard.
14. List ways that you use water for one day. Estimate the amount of water that you used and multiply by 365 to see what you use per year.
15. Save all the throw-away parts of a bag of groceries and total the kinds and amount of the materials. Weigh it. Was all of this material necessary?
16. Construct survey equipment and survey the school property. Prepare a scale map of the school property to be used in planning future development.
17. Collect cones from different kinds of pine trees—short leaf, long leaf, loblolly, or white pine. Count the number of rows of scales on the various cones and look for the mathematical pattern of these numbers. Find the numbers in the pattern in or on an eggplant or pineapple.

PHYSICAL EDUCATION

Experiences in the physical education program can increase student awareness and provide for the development of various skills. Some skill areas include survival, compass use and orienteering, archery, boating, and many others that provide for wholesome outdoor leisure time activities. Many exciting activities can be incorporated into the program that make use of the natural environment; however, the activities and materials will vary from school to school as the area and facilities differ. Leisure time activities natural to an environmental education program may be the kind that will contribute to the enjoyment, health, and welfare of people for the remainder of their lives. Some elementary school activities to be considered include:

1. Virginia reel and other folk dances that relate to the history and culture of the people
2. Indian games
3. Survival and safety skills, such as campfire building and fire safety
4. Swimming
5. Archery
6. Tarzan play
7. Outdoor cooking and meal planning, not only for survival but for nutrition
8. Knot tying and use of ropes
9. Bicycling
10. Knifemanship
11. Compass reading and mapping
12. Hiking
13. Tree climbing
14. Outdoor safety and first aid
15. Air rifle skills and safety

Some high school activities to be considered include:

1. Horseback riding
2. Casting and angling (bait casting, fly casting, spin casting)
3. Boating skills and safety (canoeing, kayaking, rafting, sailing, motorboating)
4. Backpacking
5. Camping
6. Bicycling and hosteling
7. Shoots, hunting skills and safety (building blinds, duck calls)
8. Water sports
9. Nature study
10. Hiking and mountain climbing
11. Rappelling
12. Orienteering and other adventure activities
13. Spelunking

Specific student projects could include:

1. Investigating the effects of motorbikes and other ORV's on the environment
2. Determining how the environment is affected by such outdoor activities as camping, canoeing, boating, hunting, fishing, and bird study
3. Making a collage or booklet describing different kinds of outdoor recreation
4. Writing a letter to town officials asking them to consider development of bicycle and walking paths in your community
5. Planning and preparing an outdoor menu for backpacking
6. Constructing a rope suspension bridge
7. Demonstrating how to stalk wild animals and build traps
8. Demonstrating how to construct a tool to catch fish in the wilderness
9. Learning a square dance and teaching it to the class

SCIENCE

The student's natural environment—around school, at home, and the total community—provides one of the most convenient, economical, and fascinating science laboratories.

Discovery and exploration in the immediate environment provide firsthand experiences with science and give practice in scientific methods and techniques. Scientific facts and concepts gained in this personal way become part of the student's own life style. When students can weigh the consequences of various alternatives upon their total environment, they learn the lifetime lesson of making rational choices from such options.

A familiar setting makes science more meaningful to both a person's outer physical world and inner personal world. It has these special advantages:

1. It teaches such lifelong processes as observation, measurement, classification, interpretation, prediction, and control of variables through activities in familiar surroundings.
2. It enables students to observe and investigate people's interrelationship with their environment, to learn that nature's system is a continuing, correlated series of orderly phenomena. Management of resources, cyclic aspects of matter and energy, behavioral differences and similarities, and other environmental studies teach the lifelong lesson that the earth has finite, not infinite, resources which must be maintained for both quantity and quality of human life.
3. It affords active experiences in observing changes in natural processes, man's powerful impact on nature, the correlation of causes and effects, and how to predict future occurrences.
4. It establishes lifelong values and reverence for the environment to balance attitudes toward man-made products.
5. It helps students learn to respect the tentative nature of scientific information, that scientific theories are made by humans with inherent human frailties.
6. It helps students regard science as only one vital component of the many human efforts which contribute to maintaining environmental quality.

Science in a natural outdoor setting enables students to relate harmoniously to their world. The study of science within an environmental context must begin the first year of education and extend throughout the continuum.

Some science activities that interact with environmental concerns include the following:

1. Outside, decide on a small area and mark it off if possible. (a) Begin by collecting all non-living things—rocks, plastics, wood, metal, bricks, and so on. What ways can you use to sort them and what tests can you use to find out more about them? (b) What kinds of plants are present? How many are in flower? Concentrate on a single plant. How tall is it? How deep are its roots? How many flowers does it have? Fruits? Seeds? (c) How many animals can you find? How many are there of each? What kinds of homes do they live in? How many animals are there under a large rock? (d) What can be observed about the nature of the ground? Where are there slopes, puddles, paths, and worn grass?
2. Go on a "bug hunt." How many "mini-beasts" can be found in your school yard? Place each one found in a small pill vial or container and label it with the place it was found. How many types were collected? Which area had the most? Group the creatures according to the area found. Separate the groupings by putting those found in the same place together. How would such a classification system help you the next time you go bug hunting? Keep some of the insects captured in a cage. Remember to supply the basic needs of the animals. Observe any changes in the animals. Fruit flies can be used to observe complete life cycles.
3. Set up different types of bird feeders on the school yard. Try platform feeders, window sill ones, test tube feeders for humming birds, suet in a bag or on a pine cone. Observe the birds that visit your feeding stations. Keep a record of the number and kind of birds that visit each station. Record kinds that come alone and those that eat in company. Which eat only suet? Only seeds?
4. Find out the plants in the area that furnish food for birds in the winter. Look in fields, along roadsides, and in gardens. What plants have bird tracks around them in winter? Which shrubs, vines, and trees have fruits that stay on all year?
5. Find or lay some patio or sidewalk stones. Map the position of the slabs. Count and record the number of creatures under each stone. Try to identify as many as possible. Lift and count the animals under one slab for a week. Did the number of animals change? Did you find any clues that made you think some animals died? Could lifting the slab have changed the number of creatures?
6. Construct a set of index or punch cards you could use to identify the organisms in your area. Make it a team effort—one team doing plants, another animals. The card could include characteristics, sketches, location.
7. Make maps of your area. Map the litter pattern on school grounds. Map the location of ant hills in a small area. Map erosion patterns in the soil. Draw paths people take around the school to buses, to lunch, to science class. Make a sub-map—diagram things such as water lines, sewer lines, culverts.

8. Try some daytime astronomy. Record the position of the sun by fixing tape to the window as the sun traverses the sky. Make a shadow clock by placing a bottle at a fixed point in the open on a large sheet of paper. At regular intervals during the day draw around the shadow and record the time. Repeat during different seasons of the year. Compare.
9. Use an astrolabe to determine the sun's elevation at noon each day. What was the lowest angle? The highest angle? Compare the sun's elevation at noon on December 21 to that at noon on June 21.
10. Grow things outdoors. Grow things that can be eaten such as radishes and carrots. How many seeds were planted in each row? How many plants appear? Collect the produce. How many kilograms of carrots were grown? What was the length of the longest carrot?
11. Take a field trip to interview the city engineer. Find out (a) the pathway of fresh water from its source to your school, (b) the waste water pathway from your school to where it enters a stream or lake, and (c) the source of the local water supply (river, stream, lake, wells).
12. Make a raindrop collector to help you measure the size of raindrops. Fill the lid of a shoebox with sifted flour until it is level with the lid. Smooth the top surface with a ruler. Allow raindrops to fall on the flour for a few seconds. Once the drops form hard pellets, use a flour sifter to sift them out. Repeat with drops from a sprinkler. Compare the size of drops from different sprinklers. Which sprinkler would you use on a newly seeded lawn?
13. Remove the top and bottom from five soft drink cans of the same size. Mark each 1.5 cm from the rim. Press a can 1.5 cm into each of the following soils: (a) clay, (b) sand, (c) rich garden soil, (d) grassy lawn, (e) trampled path. Using another can, pour a full can of water into each of the others. Record for each can the location, soil type, and the time required for the water to be absorbed. Use data to construct a bar graph. Which soil absorbed water fastest? Slowest? Which soil would produce runoff most easily?
14. Test soils with a soil test kit along a roadway, school yard, flower bed, or field. Test for ph, nitrogen, and phosphorous content. Investigate the color and texture of soil layers. Identify the soil types present in your community. Prepare a soil map of your area using the information collected.
15. Collect litter from a specific area. Sort the litter into categories such as paper products, building material, and glass. Count the pieces in each group and construct a graph. What was the most common type? How might a city graph differ from a rural one?
16. Mark a 6 sq. cm piece of waxed paper into 1 cm squares. Tack to a board and coat with vaseline. Select open places around the school yard where the samples can remain undisturbed for at least a week. Use a microscope to count the number and different types of material in a square. Compare the types and amounts of material with other squares. Graph the data. What does the number of particles in a square indicate about the amount of air pollution in an area?
17. Try a worm fiddling tournament. Stake off 3 sq. meter plots for each contestant. Entrants drive a stake into their assigned plots and begin scraping the stake with some tool. The vibration causes earthworms to crawl to the surface. The person who drives the most worms to the surface is the winner. Does the moistness of the soil make a difference?
18. Go on a fishing trip. Record the time of day, tide conditions and salinity (if applicable), wind velocity, cloud cover, and temperature of air and water. As fish are caught, record location, time, type of bait. Measure length and mass of the fish. Remove the stomach and record mass. After preserving the stomach, study its contents. Count and identify items present. What organisms were most and least abundant? What natural bait would be most effective for each fish caught?
19. Find the ph of water. Use a ph meter or ph Hydrion paper. Test samples from several locations. Can you relate the ph level to discharge from specific industrial plants?
20. Locate a place in your community where an echo can be heard. Make a diagram of the place. Determine the position from which a shout produces an echo. Mark it on the diagram. Look for other places. Compare their physical makeup. In what ways are they similar? Different? What is the condition that produces an echo in each situation?
21. Find out about the use of radioactive isotopes in your community. Locate a plant, a laboratory, a hospital, or a research station. Prepare an investigative plan. Do some background reading and list questions you hope to answer. Visit the place and interview those working with radioisotopes. Prepare a report on the results of your investigations.

SOCIAL STUDIES

Social studies is that discipline which deals with interaction of people with people and people with the environment. It concerns itself with urban blight, land use, governmental management, and good citizenship. Students come face to face with environmental problems and ways that they may assume individual and collective responsibility for wise management of natural resources. They practice techniques of problem solving, decision making, and critical thinking, as they apply to important problems of the day.

Here children learn that the ecosystem has a social structure as well as a natural structure, that many of our environmental problems have both natural and human causes which are as complex and interrelated as their possible solutions. Here children come to grips with an ethical structure, values, and attitudes which determine behavior that improves or degrades the environment and their health and welfare—today, and for posterity.

Environmental problems are complex and controversial—involving social, political, and economic points of view. Students need to know how to weigh information that is controversial and use the information to make wise decisions. The social studies courses serve as vehicles for analysis of social interaction and identification of potential means to improve and maintain a healthful environment. Suggested activities for social studies include:

1. Prepare a list of public and private organizations which provide information concerning air and water pollution.
2. Make a survey of sources of air pollution in your neighborhood.
3. Develop a citizen's guide to lobbying for environmental concerns.
4. Draw a map of the possible routes you could take to school. Describe the differences as to sights, sounds, comfort, time, noise, speed, etc.
5. Make a photographic record of your day, your route to school, your neighborhood, your school yard.
6. Describe the "zoning" in your school—locations of vocational courses, English, science, and other classes.
7. Describe shortcomings of past and present land use practices.
8. Make a topographic map of your school property. Suggest changes that students could make to improve the property for school and community use.
9. Organize a stream, school yard, or roadside clean-up campaign or beautification project. Erect a sign saying: "Students of _____ School have cleaned up this roadside. Help us keep it clean."
10. Find and describe evidences of how people have affected the environment. Find and describe evidences of how the environment has affected people.
11. Act out a town board meeting at which a local land use problem is the issue.
12. Write an essay using the theme "The American Indian as the First Environmentalist." Stress living in harmony with nature.
13. Take pictures of the view as you enter your town on any one of its main streets. Discuss the appearance with the class and city planners. Find out what you and your classmates may do to improve the appearance and to beautify your community on a permanent basis.
14. Find ways in which you and your classmates can assist the school and community to conserve energy (e.g., how many lights are burning; which are not needed).
15. Examine your school property as if it were an Indian village. What might the Indians find on the site they could use?
    Ink – pokeberries, elderberries
    Food – berries, roots, greens
    Tools – rocks, woods (hickory)
    Seasonings – hackberries, sour grass
    Drinks – sassafras, chicory
    Medicine – may apple, witch apple, mullein
    Toothbrush – dogwood or sassafras twig

    Which of these are still used? What is used as a substitute?
16. Write a bill and propose legislation to protect the marshlands. Using class members, role play the movement of the bill through committee, debate, voting, and finally the Governor's signature.
17. Draw a diagram to show how countries are interdependent on one another for natural resources—oil, coffee, wheat, etc.

18. Survey your community to determine how natural resources affect the economy.
19. Give an oral report on an environmentally oriented book or magazine article, e.g., *The End of Affluence.*
20. Discuss the proposition that environmental and energy management can limit individual freedom.
21. Discuss the rights and responsibilities of American citizenship in regards to environmental issues.
22. Take a field trip to a deserted farm. Why do you think it was deserted? What was life like here 20 years ago? What will life be like here 20 years from now?
23. Explore an old cemetary to learn more about the history of your community.
24. Take a field trip to a historical village or museum and discuss reasons for preservation of sites and objects.
25. Explore an old Indian site to determine what natural materials they used to live.
26. Survey senior citizens of the community and tape-record the interviews about the life style 50 years ago.
27. Attend a meeting of the community planning and zoning board. Discuss and evaluate your zoning laws.
28. Make a map locating your community's natural resources.
29. Write a historical chronology of your town, using old newspapers.
30. Write letters to your local and State representatives concerning a local environmental issue—pollution, land use, zoning, etc.

VALUES

Many aspects of environmental education, community problems, and state or national concerns can be controversial issues in the classroom. The teacher should not omit them because they involve attitudes and values and can be "hot issues." Nor should the teacher get on a soapbox and proclaim one point of view. A balanced, objective exposure, an unbiased look at all sides of a question, is important. It is not that one approach is "good" and the other "bad" but what are the pro's and con's of each? What are the compromises? How do I decide what's the best behavior or action for a given situation?

Since our decisions involve value issues, it is important that valuing be a part of environmental education. Use of values clarification processes can help students become more aware of their personal beliefs, values, attitudes, and behavior. It forces students to recognize that there are alternatives, each with its own consequences, and that no simple solutions exist.

The values clarification process usually involves students in a series of steps:

1. an identified problem or environmental issue (population, pollution, land use, transportation, wildlife management)
2. alternative solutions
3. consideration of consequences for each alternative
4. attitudes toward each alternative and its suitability for individuals and their community
5. decision as to action needed (*reference 11*)

Use of this process not only benefits school and community but assists students in mastery of decision-making skills. This process also encourages students to become personally involved in positive community action which improves student self-concept by making a contribution to the community.

When tackling a problem, the steps in general values clarification processes may be taken. However, once the decision for action is made, the plan of action should be implemented and evaluated.

Students are rarely content to talk about the environment. They want to DO SOMETHING. Action resulting in visible improvement is an essential means of reinforcement for younger children. Planting ground cover on an eroding bank, picking up litter, and writing a letter to a legislator are all ways to help students become more responsible citizens. Problems and issues for elementary students might involve:

1. School yard litter
2. Improving the play area
3. Building a nature trail
4. Finding beauty and ugliness and ways to change the ugliness
5. Improving soil (mulches)

6. Saving energy
7. Protecting animals

Problems and issues for secondary students might involve:

1. Additional energy sources are needed, but nuclear plants cause thermal pollution.
2. People must get to work, but cars cause air pollution and use fuel.
3. The water is too polluted for swimming, but people need the houses and industry that pollute the water.
4. The government should trim spending but continue to control pollution.
5. Population results in depletion of natural resources but is necessary for economic growth.
6. Mobility increases economic opportunities but decreases family and community stability.
7. We must have clean water—how clean is our source? What will it cost?

You are an environment. What you do speaks louder than what you say. You—the teacher, the administrator—teach by example.

Do you teach

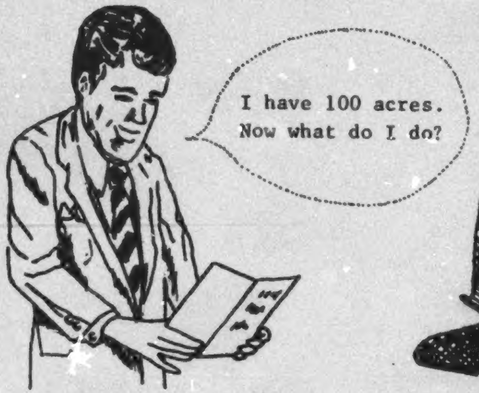
that paper is in infinite supply?
that any amount of garbage is OK, just don't litter?
that wildlife isn't really necessary and can be a pest?
that science and technology can solve our energy problems so there's no need to conserve?
that students' driving cars to school is OK if they have a license and their parents' consent?
that man must master nature?

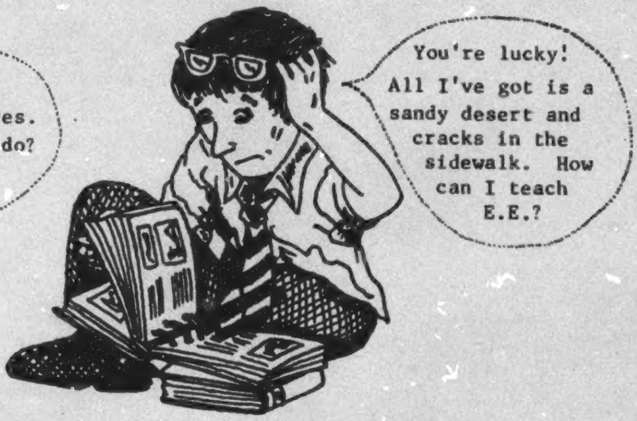
Or do you

reuse the envelopes that books and pamphlets come in?
store bits of string, seeds, foil, etc., for learning stations and student creativity?
use frozen food trays for organizing materials like paper clips, crayons?
use milk cartons to germinate seeds, build model communities, etc.?
carpool or use mass transit to come to school?
turn out lights when leaving the classroom and even leave the lights next to the windows off during the sunny part of the day?
outlaw idling buses—one of the worst forms of air pollution?
plant school gardens and maintain attractive grounds?
make composting an educational project—using those leaves and grass clippings?
outlaw one-way bottles and cans?
avoid unnecessary waste in school events—floats for parades, decorations for parties?
prevent runoffs? A paved acre sheds almost 30,000 gallons of water for each inch of rain. Mulch, dense planting, and sunken pebble gardens return water to ground instead of sewer.
check the heating system, install smoke reducing services and reduce air pollution? *(reference 21)*

You and your community teach environmental education every day of the year. Is it education for responsible stewardship or for built-in obsolescence and wastefulness?

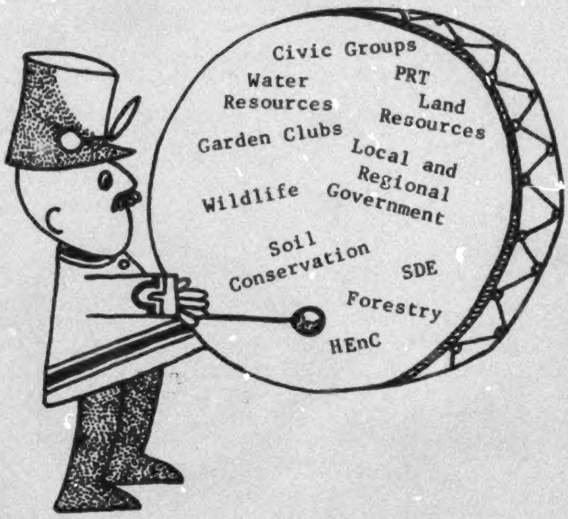
What you always wanted to know about Environmental Education but never had a chance to ask.....

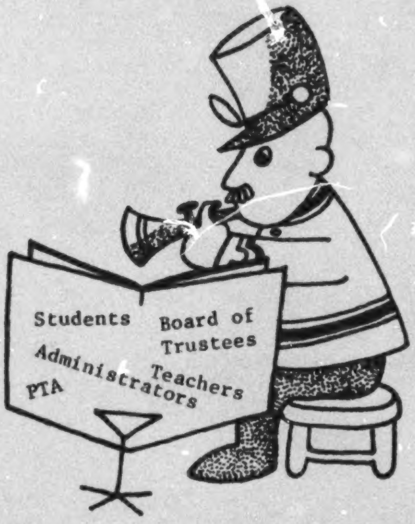

I have 100 acres. Now what do I do?


You're lucky! All I've got is a sandy desert and cracks in the sidewalk. How can I teach E.E.?

You're both lucky 'cause Environmental Education is

COMMUNITY-SCHOOL COOPERATION!


Civic Groups
PRT
Water Resources
Land Resources
Garden Clubs
Local and Regional Government
Wildlife
Soil Conservation
SDE
Forestry
HEnC


Students
Board of Trustees
Administrators
Teachers
PTA

WHAT YOU ALWAYS WANTED TO KNOW ABOUT ENVIRONMENTAL EDUCATION BUT NEVER HAD A CHANCE TO ASK

1. How much will it cost?

Nothing, to begin to utilize the existing facilities of your school and school grounds. Most schools already have the *People and their Environment* guides.

Many other inexpensive materials are available, including publications that describe equipment which students can make themselves. Government surplus can also be the source of a multitude of useful and inexpensive materials.

Funds from government, business, industry, and civic organizations may provide the initial thrust for special projects. (See Appendix J.) As your program progresses, teachers will request more references and equipment for more sophisticated activities. Even then some materials may be obtained from various environmental agencies which are always interested in working with schools.

The problem of finance is common to all aspects of the school program. Since environmental education is an integral part of the curriculum, the same principles of finance should apply.

2. My curriculum is already crowded with subject matter and my time already allocated. How can I add more to an already full schedule?

Environmental Education need not be an "add on." It may be a strategy to teach what is already a part of the curriculum. Research indicates that infusion into existing curricula is more successful than introduction of a new course. However, new courses in Environmental Studies are becoming very popular at the high school level.

3. Why should I consider school site development?

First, it can improve the instructional program by increasing the variety of learning environments. Second, it is economically sound (erosion control). Third, it promotes community-school cooperation and improves public relations. Fourth, it can provide more appropriate areas for physical growth and fitness.

4. But I have no trained teachers.

The teacher is not a dispenser of knowledge but a designer of learning strategies by which students can learn. In this role both teacher and student together can acquire information and investigate their community, their natural and man-made environment. Community resource people and the school librarian can be constant sources of information and assistance. The State Department of Education provides a full-time consultant to assist in your planning and teacher education programs.

5. Our school organization and faculty are not flexible enough for interdisciplinary instruction.

With schools increasingly turning to individualized instruction, modular scheduling, cooperative planning/teaching, team teaching, nongrading and mini-courses, flexibility ceases to be a major problem. More and more, teachers are realizing that their strategies must be largely determined by the learning styles of the students rather than the content of the subject and that a variety of methods and materials results in greater success.

6. You say EE involves attitudes and "value clarification." We do not think that teachers should inculcate their own values into the minds of their students.

EE does not encourage this either but it does urge teachers and students to examine a problem or situation from different points of view and consider all alternatives and possible consequences.

7. With the cost of gas and expense of using buses, transportation becomes too much of a problem. Can I have an EE program without extensive travel?

Parents and interested civic leaders are often willing to assist in providing transportation. If an EE committee has been established, they will help find necessary funds. High school students often provide their own transportation.

8. How do I get started?

Try a summer school course oriented to a real COMMUNITY PROBLEM for high school students. This could involve air and water monitoring, stream study, land use, and erosion studies. There are no simple solutions and most problems are very complex; however, problems and skills to identify and solve them are valuable to all citizens. The preparation of a report should include objective data and evaluation, especially from the people and the entities who are:

a. causing the problem
b. opposing the problem
c. having a legal responsibility to deal with the problem
d. leaving a significant impact of the problem on the environment, including plant and animal population as well as humans
e. contributing to possible solutions and trade offs

It should also include suggestions for actions that an individual or group could perform to help minimize or resolve the problem.

With INDEPENDENT STUDIES, students receive credit for individual or small group work in science, social studies, or language arts. Usually this program is research oriented and available to students in the 11th and 12th grades only. The teacher awarding the credit is the supervising teacher who works closely with other teachers who may serve as resource persons and especially with the librarian. The supervising teacher prepares guidelines for the students and reviews their progress periodically.

If you really want to get involved, find some interested, enthusiastic teachers, a part-time or full-time coordinator, and set up a committee for planning and development. (See pages 13–15.)

9. What about bad weather?

EE is not nature study–it includes both natural and man-made environments. Therefore, many studies can be conducted in the classroom. Panel discussion, debate, discussion of legislation and how to pass a bill can all involve the environment and its problems.

10. Can teachers of every subject incorporate environmental education into their curriculum?

Even in geometry one can study the complementary angles in the room, the symmetry of shells and flowers. In history there are many examples of the impact of the environment on the people–the potato famine. In economics the effect of consumer choices on the economy and on the environment and the effect of pollution control devices on the job market are possible topics. Examples and materials are abundant. (See examples pages 87–98.)

11. What materials are available?

Most schools have been provided with the eight *People and Their Environment* guides that were developed by teachers in this state. These guides provide complete lessons that may be inserted into a conventional course or several could be put together to form a mini-course. In addition, an energy guide and several guides in vocational areas have been printed. Various educational and commercial agencies have developed materials for all instructional levels. A listing of helpful materials is provided on pages 110–126.

12. What can I possibly do with the compacted clay or sandy desert that is in my school yard? (See pages 32–34.)

a. Make a compost pile and use it in designated areas for garden planting later. Let it be a learning situation with questions such as: How long will it take the vegetation (grass cuttings or leaves) to decompose? What difference does temperature make inside the pile, outside the pile? Why?
b. Make a few habitats for small animals by placing logs or small rocks in various places. Observing animals who come to inhabit these new homes can provide many learning experiences.
c. Make instruments for checking weather, pollution, insect collecting, telling time, etc.
d. Mark off an area (small at first), fertilize it, and plant a garden.
e. Make and set up bird houses and feeders.

f. Plant plants for a variety of sensory experiences (herbs, sassafras, etc., for smell; persimmon, dogwood, oak, and maple for touch; blackberry, pecan for taste).

Students and teachers will come up with many more ideas.

13. Aren't teachers and school administrators more susceptible to law suits when outside or in the community?

Basically, if the teachers are not negligent in their duties, they should have no problems. When students participate in planning where they will go and what they will do, it has been found that they take care of themselves better than if they had been *told* where to go.

Usually a number of parents or resource people are involved in a field investigation. These added adults are a deterent to adventurous little ones. Most school systems take full precautions to inform parents of what students will be doing and obtain permission or blanket authorization at the beginning of the course. However, a teacher or administrator is never protected against blatant negligence.

CURRICULAR RESOURCES

Where do I find ideas for teaching?

A curriculum committee should obtain and review materials keeping in mind:

a. variety of materials (reading, AV, activity)
b. variety of points of view (biases)
c. suitability of reading and interest levels
d. all aspects of the environment

Sources of ideas include:

a. variety of textbooks
b. professional publications
c. technical books and pamphlets
d. newspapers, periodicals, TV, and other mass media
e. audiovisuals
f. games and activity cards
g. locally produced instructional materials
h. publications from other communities, states, and publishing houses
i. materials from industrial and civic groups and organizations
j. materials from local, state, and federal government agencies
k. Department of Education materials (*People and Their Environment*, Health Guides, Agriculture Education Guides, etc.)
l. students' questions and suggestions

As a source for ideas for investigations and as a means for introducing new teachers to the school's environmental education program, a file of all investigations conducted by students in the school can be helpful. Records of these investigations should include teachers' names, grade level, questions raised, investigative procedures, summary of findings, problems encountered, successful experiences, and suggestions for modifying future related investigations. *(reference 14)*

LIBRARY

The most valuable resource for the teacher, and often for the community, is the library. School and classroom libraries should contain all kinds of field study guides as well as information about various aspects of the environment. Teachers should be alert for useful references and recommend them for purchase by the school librarian. Files of newspaper clippings and magazine articles may be collected in a vertical file. The list of resources in this document may serve as a starting point for the development of a useful environmental education library support system.

The State Library System can obtain special information from other libraries if it is not available locally. Library directories of state and regional government agencies provide teachers with a direct line to specialized resource people and materials.

Teachers will find that studies in the environment stimulate interest and inquiry, motivating students to gravitate to the library to find the information necessary to satisfy their curiosity. Therefore, the librarian should be kept informed of classroom activities so that she may be prepared to give the kinds of assistance needed.

Technical assistance may be obtained from your Regional Government Planning Office. There are ten such planning offices in the state. (See Appendix B.) State and federal governmental agencies also have personnel to provide technical assistance. (See Appendix A.)

These people should not be "add on" or "bulletin board" type additions to the program. They should be called on only when their services are needed and for a special purpose. If they make a presentation to the class, it should be part and parcel of the existing curriculum and the unit being studied. If they are called upon to work with a group of students involved with a special project, arrangements would be made in advance and responsibilities clarified for all concerned. Providing students with opportunities to work with experts offers valuable insight into possible careers and the problems of resource management.

Student projects and internships could include park management and maintenance, school and community beautification, solid waste disposal, timber harvest, transportation problems, water quality, etc.

There are many "hidden specialists" in your community—local people with special hobbies and interests. They may turn out to be an inspiration to your students and valuable aides in the classroom.

Materials List

The following list includes those aids considered most helpful to the classroom teacher.

The resources have been examined and a brief description is included. Resources which contained many ideas for learning activities were sought, rather than texts or reading material, since the quantity of readers is too great to be listed here. The Materials List is divided into these sections:

1. K–12 materials
2. Elementary materials
3. Secondary materials
4. Activity cards
5. Games
6. Free and inexpensive materials
7. Periodicals
8. Resource materials
9. Kits or packaged multi-media materials

Publishers' addresses and costs are included whenever possible so that materials may be easily obtained. Most of the items listed are available for reference and for your perusal in the State Environmental Education Consultant's Office. Many of these publications would make valuable additions to the school library. However, the success of this listing depends on its use as a source of new ideas and teaching strategies.

Create Tomorrow . . . Today. Washington Superintendent of Public Instruction. Old Capitol Building, Olympia, Wash. 98504. 1974. K–12.

Curriculum Enrichment Outdoors. Harper and Row, 2500 Crawford Ave., Evanston, Ill. 60201. $3.50.
A collection of over 350 suggestions for activities using the outdoors.

Deschool Primer: Your City Has Been Kidnapped. W. Ron Jones. Addison Wesley Publishing Co., South St., Reading, Mass. 01867. 1972. Grades 4–12.
This guide book is an open-ended series of pictures and activites designed to stimulate students to discover their urban environment. "Depending on your interests, it can serve as a textbook, sensory guide, a sourcebook for locating city treaures, an investigation manual into city institutions, or perhaps, a simple game book."

Encounters in Environmental Education. Arlyn A. Kline. Kendall/Hunt Publishing Company, Debuque, Iowa. 1974. 153 pp. $4.95.
An excellent source of activities for all grade levels and subject areas. Organized into eleven categories.

Energy and Man's Environment. Thomas F. Ris. Education Research Systems, Inc., 2121 Fifth Avenue, Seattle, Wash. 98121. 1973. $2.25.
An interdisciplinary guide containing activities for grades K–12 for study of energy.

Environmental Education Activities Manual. Dorothy A. Cox and William B. Stapp. 1006 pp. $8.50 per set of six.
These volumes are the culmination of seven years of work in helping to develop a philosophy and a complementary structure for integrating environmental education into an existing curriculum (K–12).

Environmental Education Objectives and Field Activities. Paducah Public Schools, 10th and Clark Streets, Paducah, Ky. 42001. 1971. K–12. $5.00.
A collection of teacher-made activities.

Environmental Education on an Urban School Site . . . A Guide for Teachers. National Park Service, Pacific N.W. Region, 523 Fourth and Pike Building, Seattle, Wash. 98101. Grades 4–8.
Outdoor investigations for city schools.

Interdisciplinary Environmental Education. John Arena, Director. Brevard Co., Fla., IEE Office, High School, 3600 S.W. College Ave., Fort Lauderdale, Fla. 33314. 1972. Grades K–12.
A series of valuable interdisciplinary guides for students and teachers (e.g., *Little Johnny Raindrop, Water and Something Else).*

100 Teaching Activities in Environmental Education. John A. Wheatly and Herbert L. Coon. ERIC/SMEAC, 1800 Cannon Drive, 400 Lincoln Tower, Ohio State University, Columbus, Ohio 43210. 1974, 1976. Three volumes.
Activities grouped by grade level (K–3, 4–6, 7–9, 10–12) and for every subject area. Includes problem areas, concepts, purposes, references, and procedures.

People and Their Environment. J. G. Ferguson Company, Six North Michigan Avenue, Chicago, Ill. 60602. 1969. Grades 1–12. $1.20 in South Carolina. May be ordered from Alice Linder, Environmental Education Consultant, State Department of Education, Room 803, Rutledge Office Building, Columbia, S.C. 29201.
This is a series of eight guides developed by 34 South Carolina teachers for grades 1–12 which includes: Grades 1–3, Grades 4–6, Social Studies 7–9, Science 7–9, Biology, Social Studies 10–12, Home Economics, Outdoor Laboratory 1–12.

Project Ice – Instruction Curriculum – Environment. Robert Warpinski, Director. 1927 Main St., Green Bay, Wis. 54301. $5.00 per set. Grades K–12.
A series of ten environmental education supplementary guides in various subject areas providing behavioral objectives and associated learning experiences.

Self-Earth Ethic. John W. Hart and Jessie M. Turner. The Interstate Printers and Publishers, Inc., Danville, Ill. 61832. 1972. K–12. $3.50 each.

A series of three curriculum guides for grades K–12 for environmental education. Emphasis is on basic concepts and activities move from the concept of interdependence to problem solving and man's responsibility. Eight levels are designated for the activities.

Teaching in the Outdoors. Donald R. Hammerman and William M. Hammerman. Burgess Publishing Company, 426 South Sixth St., Minneapolis, Minn. 55415. 1974. 120 pp. Grades K–12. $2.95.

Suggestions for teaching out-of-doors for all subject areas.

Tips and Tricks in Outdoor Education. Malcolm Swan, Editor. The Interstate Printers and Publishers, Inc., Danville, Ill. 61832. 1970. Grades K–12. $3.95.

A collection of activities in the out-of-doors.

Yellow Pages of Learning Resources. Richard Saul Wurman. MIT Press, 28 Carleton St., Cambridge, Mass. 02412. 1972. 94 pp. Grades 1–12. $1.95.

A guide to the utilization of community resources. It is done in a "phone book" format with one to two page instructions on what you can learn from, or at, airports, cemetaries, gas stations, etc. This guide also helps teachers extend the classroom into the community. Emphasis is on urban ecology.

Young Art: Nature and Seeing – A Fundamental Program for Teachers. Jeannette Lacy. Van Nostrand, Reinbold Co., 450 West 33rd St., New York, N. Y. 10001. Grades K–12. $5.95.

A program of Art and the Environment.

Elementary

A Field Trip Guide: (1) Soil (2) Winter (3) Small Worlds. Helen Ross Russell. Little, Brown, and Company, 34 Beacon St., Boston, Mass. 02109. 1972. $4.95.

Student tests for grades 1–3 containing activities to develop environmental awareness.

Adventures in Environment. Silver Burdett Company, 3272 Peachtree Rd. N.E., Atlanta, Ga. 30305. 1971. Grades 4–6. A series of units which contain a classroom book – $3.33. Outdoor book – $1.50. Teachers' Guide – $1.44.

Based on five conceptual schemes or "strands." Includes student activities. Picture packets are available for $28.80.

All Around You: An Environmental Study Guide. Bureau of Land Management, Department of the Interior. Washington, D.C. 20240. 1971. 126 pp. $2.00.

A booklet developed by six students and suggestions for developing environmental awareness and understanding of natural and urban ecosystems (upper elementary and jr. high).

Anti-Pollution Lab. Elliott H. Blaustein. Sentinel Book Publishers, Inc., 1721 East 22nd St., New York, N.Y. 10010. 1972. 128 pp. Grades 1–7. $1.95.

Simple, inexpensive, practical methods of pollution detection.

Discovering Your Environment. Orville E. Jones and M. D. Swan. The Interstate Printers and Publishers, 19 N. Jackson St., Danville, Ill. 61832. 1971. Grades 4–6. $8.25.

Ditto masters for experiences in the school and on the school grounds. Pencil and paper activities involve students in observation, data collection, and problem solving.

Elementary Science Study (ESS). Webster Division, McGraw-Hill Book Company. $2.34 to $7.98. Class Kits – $14.95 to $158.95. Many need no special equipment.

Major aim is to encourage children to examine and analyze, and thus to understand the world around them. Fifty-six titles include: *Pond Water, Changes, Microgardening.*

Environment and You. Thomas M. Baker and John Rusher. Craig Scott, Robert J. Brady Company, Rt. 197, Bowie, Mo. 20715. 1974. $7.95 each, $63.60 per set of 8.

A series of eight booklets (grades 1–8) containing transparencies, ditto masters, and lessons to accompany the transparencies. Each lesson consists of teaching objectives, lesson content, and learning activities. The first four books utilize Jumper the Rabbit as an almost human character and friend to guide the students through the various environmental activities and learning experiences.

Environmental Studies Series. Patrick A. O'Donnell and Charles W. Lavaroni. Addison-Wesley Publishing Company, Inc., 9 Dunwoody Park, Suite 120, Atlanta, Ga. 20241. 1970. 94 pp. $1.50 per book.

Student texts for grades 4–9 introduce problems, give information, provide investigations and experiments. Series includes: *Noise Pollution, Water Pollution,* and *Air Pollution.*

Examining Your Environment. J. K. Couchman, J. C. MacBean, A. Slecher, and D. F. Wentworth. Winston Press/Mine Publishing, Inc., 25 Groveland Terrace, Minneapolis, Minn. 55403. 1972. Grades 5–8. $2.94 per book. Complete set $33.00.

Full-color activity books; each one on a major problem area. Children see the "how" and "why" of their environment through stimulating projects and group discussions using materials they make themselves. The series includes: *Mini-Climates, Snow and Ice, Birds, Pollution, Trees, Running Water, Mapping Small Places, Astronomy.* Distributed by BFA Educational Media, 2211 Michigan Ave., Box 1795, Santa Monica, Calif. 90406.

Growing Up Green, Parents and Children Gardening Together. Gloria Huckaby and Alice Skelsey. Workman Publishing Company, 231 E. 51st St., New York, N. Y. 10022. 1973. Cloth – $8.95. Paper – $4.95.

Filled with activities for primary children (e.g., germinating seeds, how to garden, pressing flowers, leaf patterns, trees and birds).

Knock the Four Walls Down: Environmental Education Investigations for the Elementary School. B. J. Amundson and Nick Rodes. P. A. Schiller and Associates, P.O. Box 307, Chicago, Ill. 60690. 1973. K–10. Cost per lesson varies from $.35 to $1.50.

A collection of 52 brief investigations. Each purchased as a separate lesson.

Man and the Environment. Paul Holobinko, Frederick A. Rasmussen, and Victor M. Showalter. Educational Research Council of America, Houghton Mifflin Company, 666 Miami Circle N.E., Atlanta, Ga. 30324. 1974. Grade 7. $5.40.

Me and My Environment. BSCS. Hubbard, P.O. Box 105, Northbrook, Ill. 60062. Grades 6–8.

For the educable mentally handicapped.

My Book of Things to See and Do in the Out-of-Doors. Dean Freund. Worthington City Schools, 600 West Dublin-Granville Rd., Worthington, Ohio 43085. Grades K–3. $3.00.

An introduction to the outdoors.

Our Environment, Problem or Promise? Paul Nowak and Wayne Schimpff. Nystrom, 3333 Elston Ave., Chicago, Ill. 60618. 1972. Grades 4–9. $175.00.

A kit – teacher guide, transparencies, filmstrips, cassettes, study prints. Program consists of five kits – pre- and post-assessment activities, lesson plans, and pre- and post-attitude surveys.

Save the Earth! An Ecology Handbook for Kids. Betty Miles. Random House/Alfred A. Knopf, Inc., 201 East 50th St., New York, N. Y. 10022. 1974. 91 pp. $5.57.

This is a guide for elementary children that presents both environmental problems and solutions. It includes cause and effect, how things develop and change, how all of nature is interconnected.

Science Curriculum Improvement Study (SCIS). Rand, McNally & Company, P.O. Box 7600, Chicago, Ill. 60680. 1962. Grades 1–6.

First semester units provide experiences that are designed to aid children in moving from the stage of concrete operations to a stage involving formal thought. The units include: Organisms – 1st grade, Life Cycles – 2nd grade, Populations – 3rd grade, Environments – 4th grade, Food Transfer – 5th grade, Ecosystem – 6th grade, Natural Selection – 6th grade.

Ten-Minute Field Trips. Helen Ross Russell. J.B. Ferguson Co., Six North Michigan Ave., Chicago, Ill. 60607. 1973. 173 pp. $4.85.
Lists of simple ideas for using the school ground for environmental studies K–6. Includes background information and related classroom activities. Good for any environment – urban, rural, or suburban.

The Urban Environment – A Teacher's Guide. Phyllis S. Busch. J.G. Ferguson Co., 100 Park Ave., New York, N. Y. 10017. 1975. 231 pp. Grades K–3. $4.85.
Sixty-three lessons and projects with little equipment needed. Format similar to *People and Their Environment.*

Secondary

Contours – Studies of the Environment. William Andrews, Editor. Prentice-Hall, Inc., 680 Forrest Road N.E., Atlanta, Ga. 30312. 1972. $3.00.
Each of the four field guides of lab, field, and case studies could easily serve as a text for a separate course, or all could be used as supplementary references for a single course. For high school and college level students. Series includes: Freshwater Ecology, Soil Ecology, Environmental Pollution, and Terrestrial Ecology.

Deciding. H. B. Gelatt, B. Varenhorst, and R. Carey. Publications Order Office, College Entrance Examination Board, Box 592, Princeton, N.J. 08540. 1972. High School. $2.50. *Deciding: A Leader's Guide* also available.
To help develop decision-making skills.

Deciding How to Live on Spaceship Earth. Rodney F. Allen et al. Plover Books, St. Mary's College Press, Terrace Heights, Winona, Minn. 55987. 1973. $3.95. Teacher's Guide – $1.50.
Seven encounters with environmental problems from a value clarification approach.

Discovering the Outdoors, Discovering Plants, Discovering Nature Indoors. Laurence Pringle, Editor. The Natural History Press, 501 Franklin Avenue, Garden City, N. Y. 11530. Grades 7–12. $4.95.
Ideas for projects and investigations.

Ecosystem Analysis "Basic" Ecology and Management. Dr. Robert W. George, Arnold L. Mokma, and Dr. Martin Hetherington. Michigan State University, East Lansing, Mich. 48823. 1973. Grades 7–12.
A teacher's guide for basic environmental concepts and skills used for on-site ecosystem analysis.

Energy and Human Affairs. BSCS. P.O. Box 930, Boulder, Colo. 80302. 1975.
A 9-week unit includes physical laws related to energy; manufacture and distribution; energy sources for the future; energy game and investigations using surveys, interviews, etc.

Environmental Education Modules. Project Clean. Shawnee Mission Public Schools, 7235 Antioch, Shawnee Mission, Kans. 66203. Grades 7–12. $1.50 per module.
Many titles in this set of teacher-prepared material for various subject areas.

Environments in Profile: An Aquatic Perspective. W. Michael Kaell and J. K. Frey. Harper and Row, Publishers, Inc., 10 E. 53rd St., New York, N. Y. 10022. Grades 9–12. $3.95.
Concepts and lab activities for high school.

Exploring Your Environmental Choices: An Inquiry and Decision-Making Approach. Developed by the Health and Welfare Division of Metropolitan Life. Environmental Choices, Metropolitan Life, P.O. Box 232, New York, N. Y. 10010. 1974. High School. $18.50.
The materials pose many environmental issues and suggest a wide range of viewpoints and trade offs to consider. They do not represent any particular point of view. Students examine their personal priorities and make their own decisions based on information they obtain. Includes transparencies and tapes.

Field Ecology, Life in the Soil. BSCS Laboratory Blocks. D.C. Heath Co., Lexington, Mass. 1968.

Investigating Your Environment. Biological Sciences Curriculum Study. Addison-Wesley Innovative Series. Addison-Wesley Publishing Co., Sand Hill Road, Menlo Park, Calif. 94025. 1975. 176 pp. Junior high and high schools. Student Handbook – $3.99; Teacher's Handbook – $3.99; *The Environment: Some Viewpoints* – $2.01; *The Price of Progress* – $1.80; *[illegible]d for Humanity* – $1.80; *Human Population* – $2.19; *Solid Waste* – $2.01; *Pesticides* – $1.80; *Land Use* – $2.37; *Water Quality* – $2.01.

A collection of ideas and techniques for environmental study. Includes activities under titles such as Values, People Problems, H_2O and Air Quality, Noise, and Land Use.

Man and Environment for Secondary Schools. NAEE. NAEE, 5940 S.W. 73 St., Miami, Fla. 33143. 1974. High school. $4.00.

Twenty modules consisting of concepts and objectives for students. Interdisciplinary, open-ended activities. Could provide basis for a course or a single module, could supplement social studies and/or ecology.

Manual of Field Biology and Ecology. Fifth Edition. Allen H. Benton and William E. Werner, Jr. Burgess Publishing Co., 7108 Ohms Lane, Minneapolis, Minn. 55435. 1972. 400 pp.

A comprehensive field guide, reference list, procedures, data sheets, etc.

Our Man-Made Environment – Book Seven. B. Chapman, Alan Levy, and Richard S. Wurman. The MIT Press, 28 Carleton St., Cambridge, Mass. 02142. 1970. 1 to 3 weeks. Grades 7–9. $4.95.

A workbook of problem-solving exercises and activities calls on students to utilize their judgment and creativity. Punch-outs and other "hands-on" activities act as catalysts to further inquiry.

Physiological Adaptation. Earl Segal. BSCS. D. C. Heath and Co., 1465 Northside Dr. N.W., Atlanta, Ga. 30318. 1963–69. $2.37.

BSCS Laboratory Blocks are self-contained units, each providing intensive study in biology.

Plant Growth and Development. Addison E. Lee. BSCS. D.C. Heath and Co., 1465 Northside Dr. N.W., Atlanta, Ga. 30318. 1963–69. $1.92.

BSCS Laboratory Blocks are self-contained units, each providing intensive study of one topic in biology.

Preserving Man's Environment. Joseph Hagerty, John E. Heer, and Joseph L. Pavoni. Data Courier, Inc., 620 South Fifth Street, Louisville, Ky. 40202. 1974. $11.95.

A book of activities, objectives, resources, and test items in many environmental topics for high school.

Process of Choice. MIT Press, 190 Merrimac St., Lawrence, Mass. 01843. 1973. Grades 7–12. $8.95.

Five booklets dealing with decision making and the urban environment.

Teaching Science with Garbage. Albert Schatz and Vivian Schatz. Rodale Press, Inc., 33 East Minor St., Emmaus, Penn. 18049. 1972. Grades 7–12 but adaptable to lower grades. $2.95.

This is an interdisciplinary text that involves students in simple, inexpensive experiments. Interest and motivation are high as students study impact of garbage and positive alternatives.

The Delicate Balance: An Environmental Chemistry Module. IAC Project. Harper and Row, 1973. $1.50.

One of a series of modules in chemistry called "Interdisciplinary approaches to Chemistry" and written especially for the average "non-scientist" student. It is student-centered, activity oriented, relevant interdisciplinary, and fun.

The Environmental Education Guide Series. Institute for E. E. 8911 Euclid Ave., Cleveland, Ohio 44106. 1972. Grades 4–12. A series including curriculum activities guides to: (1) Water Pollution Procedures–High School – $6.00 per set (this guide may be obtained from the Government Printing Office, Washington, D.C., for $4.50 per set); (2) Water Pollution Equipment – $6.75; (3) Solid Waste – $6.75; (4) Birds, Dogs, and Weather – $6.75.

There Is No "Away"; Reading and Language Activities in Ecology. Joan G. Roloff and R. G. Wylder, Editors. Glencoe Press, Macmillan Co., 8701 Wilshire Blvd., Beverly Hills, Calif. 90211. 1971. High school English and Ecology. $5.95.

Supplementary resource for reading, English, or social studies including articles, cartoons, and activities.

Urban Studies. Milwaukee Public Schools. Milwaukee Public Schools, Milwaukee, Wis. 1974.

A teacher's guide especially appropriate for high school and social studies providing a conceptual framework with related materials and activities.

Activity Cards

All Around You Series/Activity Cards. Winston Press, 25 Groveland Terrace, Minneapolis, Minn. 55403. 1969. Grades 4–8.

Spring Set, 10 Cards – $5.69: Summer Set, 20 Cards – $11.49; Autumn Set, 20 Cards – $11.49; Winter Set, 10 Cards – $5.69. These large, laminated cards, illustrated with four-color photographs, give basic information on carefully planned questions to help children work on their own. Published originally for use in British Primary Schools. Each set includes a teacher's guide.

Baker Nature Study Packet. Tunis Baker. Baker Science Packets, 650 Concord Dr., Holland, Mich. 49423. Grades K–8. $5.95.

Activity cards arranged by seasons.

Broad Spectrum's Environmental Education Program. Brevard Company's Center for Environmental Learning, 705 Avocado Ave., Cocoa, Fla. 32922. 1975. Primary CEL Blocks – $5.00, Intermediate CEL Blocks – $6.00. Grades 7–12. 5 Multidisciplinary Learning activities and units; 4 Interdisciplinary units – some with color slides. Prices range from $1.10 to $4.15.

CEL Blocks are large packets of imaginative activity cards. In-service workshops are available.

Discovering Nature: 135 Nature Study Activities. Educational Insights, 423 S. Hindry Ave., Inglewood, Calif. 90301. Grades 5–9. $5.95.

One hundred and thirty-five cards for promoting understanding of the environment.

Ecolab: Learning Concepts. J.L. Johnson and J.H. Mann. Benefic Press, 10300 West Roosevelt Road, Westchester, Ill. 60159. Grades 3–6. $33.00.

Activity cards for urban and rural ecology studies for science and social studies.

Environmental Studies Kit. Robert Samples. Addison-Wesley, 9 Dunwoody Park, Atlanta, Ga. 30341. 1971. K–12. $19.98. 75 Cards.

Self-directed studies stressing development of student's self-esteem in an open learning environment. Discovery oriented and interdisciplinary.

Environmental Values Action Cards. Minnesota Department of Education. Capitol Square Building, 550 Cedar St., St. Paul, Minn. 55101. 1974.

Unique cards for elementary children aimed at awareness of themselves and others, values, and significantly different means of expression.

Investigations in Ecology. Beth Schultz and Phyllis Marcussio. Charles E. Merrill Publishing Co., 1300 Alum Creek Dr., Columbus, Ohio 43216. 1972. Grades 4–10. $9.95.

Seventy activity cards designed to help students understand their environment and develop the skills for problem solving. Topics include: People and Environment; Plants, Animals, and Environment; and Earth. Includes teacher's guide for grades 4–10 and many ideas to use for individualized instruction.

Our Environment: Choices and Actions. Margaret Cottom-Winslow. Harcourt Brace Jovanovich, Inc., Saddle Brook Industrial Park, Saddle Brook, N. J. 07662. 1975. Grades 3–8. $60.00 per set of 30 four page student cards.

Interdisciplinary activity cards, individuated to permit children to observe, understand, and improve their own homes, school, neighborhood, or community environment. Set A – Home and School, Set B – Neighborhood, Set C – Community.

Games

Extinction – The Game of Ecology. Sinauer Associates, 20 Second St., Stanford, Conn. 06905. High school. $11.95.

Houghton Mifflin Company, 6626 Oakbrook Boulevard, Dallas, Tex. 75235.
The Pollution Game – $7.50
The Planet Management Game – $12.00
The Redwood Controversy – $7.50

Man in His Environment. Coca-Cola Service, 310 North Avenue, Atlanta, Ga. 30301. Grades 1–12. $10.05.

Newtown. Environmental and Outdoor Education Materials Company, Dowling, Mich. 49050. Kit for 10 students – $16.00. The Environmental Game of Town Planning.

Outdoor Survival. Environmental and Outdoor Education Materials Company, Dowling, Mich. 49050. $10.00.
A game of wilderness skills which includes a 24 page outdoor survival primer of techniques for staying alive.

The Household Energy Game. Thomas W. Smith and John Jenkins. Marine Studies Center, University of Wisconsin, Madison, Wis. 53706. 1974. High school.

The Dirty Old Game of Pollution. Northwest Public Power Association, Vancover, Wash. 98550. K–3. Free.

The Garbage Game. Educational Ventures, Inc., 209 Court Street, Middletown, Conn. 06457. K–3. $7.00.

Urban Systems, Inc., 1028 Massachusetts Ave., Cambridge, Mass. 02138.
Dirty Water – Grades 3–12 – $10.00
Smog – Grades 8–12 – $10.00
Ecology – Grades 5–12 – $10.00
Population – Grades 7–12 – $10.00
Litterbug – Grades K–3 – $5.00
Clean-Up – Grades K–3 – $5.00

Where People Live Concept Pack – Unit I: Climate and Land, Unit II: Shelter and Food. Milton Bradley Company, Springfield, Mass. 01101. Grades 4–8. $7.00.
Board games and posters with information for the teacher.

Wildlife. Lowe Company, Inc., New York, N. Y. 10010. K–3. $7.50.
Duration is less than a single class period.

Free and Inexpensive Materials

A Child's Garden: A Guide for Parents and Teachers. Chevron Chemical Co., Orthro Division, 200 Bush St., San Francisco, Calif. 94104. 1972. $1.50. 45 pp. Grades 1–10.
A well-illustrated guide containing ideas for planting and maintaining a garden, information on soil types, fertilizer, hormones, and growth.

Air Pollution, A Primer on. Mobil Oil Corporation, Department St., 150 East 42 Street, New York, N. Y. 10017. One unit of 10 sets.

Air Pollution Experiments for Junior and Senior High School Science Classes. Donald C. Hunter and Henry C. Wohlers. Air Pollution Control Association, Publications Department, 4400 Fifth Ave., Pittsburg, Pa. 15213. 1969. 38 experiments, 128 pp. $1.50 per copy.

A Place to Live. Duryea Morton. National Audubon Society, 950 Third Avenue, New York, N. Y. 10022. 1970. $1.50 – student text, $2.10 – teacher guide.

These activities make use of the local environment, particularly urban. They are flexible and the workbook is easy to read. It includes directions for 10 walks. Elementary.

Better Environment Booklet Series. Soil Conservation Society of America, 7515 N.E. Ankeny Rd., Ankeny, Iowa 50021. 1973. All grade levels. $.30 each student, $.25 each teacher.
A series of informative cartoons which include: (1) The Story of Land, (2) The Wonder of Water, (3) Help Keep Our Land Beautiful, (4) Food and the Land, (5) Plants—How They Improve Our Environment, (6) Working Together for a Livable Land, (7) Making a Home for Wildlife on the Land, (8) The Earth Our Home in Space, (9) Plants, Animals and Man—Sharing the Earth.

Clean Earth Handbook. Nancy Arnold. Sunflower Publications, 1198 Main St., Seattle, Wash. 98104. 1971. $4.00/dozen.
Information and lists of things to do in recycling, energy, citizen action projects, etc.

Conservation and the Water Cycle. Soil Conservation Service, Information Division, Washington, D.C. 20250. Free.

Conservation in Elementary Schools, An Outline for Teaching. Soil Conservation Service, Information Division, Washington, D.C. 20250. Grades 1–8. Free.

Detergents and the Environment. Lever Brothers Company, Consumer Education Department, 390 Park Ave., New York, N. Y. 10022. 19 pp. Classroom quantities.

Don't Waste Waste. Environmental Action Coalition, 235 East 49th St., New York, N. Y. 10017. 1973.
This and other publications by EAC, for example, *Less Power to the People: Environmental Energy Use,* consist of lessons with many suggested activities for students.

Ecology. Beth S. Atwood et al. Xerox Educational Publications Education Center, Columbus, Ohio 43216. 1971. Each book 48 pp. $.45. Grades 4–6.
A series of three paperbacks: *Habits and Habitats, Nature and Needs, Problems and Progress.* A weekly reader series with the same type of paper and format.

Ecology Action Pack. Dayton Museum of Natural History. McDonald's Corporation, One McDonald Plaza, Oak Brook, Ill. 60521. 1974. Free.
This is a set of six ecology units with spirit duplicating masters.

Electric Utility Industry, Questions and Answers about the. Edison Electric Institute, Educational Services, 90 Park Ave., New York, N. Y. 10016. 40 pp. Single copy available to teachers on request.

Environment and Industry, The Story of. American Iron and Steel Institute, Education Department, 1000 Sixteenth St. N.W., Washington, D.C. 20036. 20" x 30" chart that folds into a 9" x 10" book format. Classroom quantities.

Environmental Awareness, An Action Approach. Bureau of Indian Affairs, 1951 Constitution Ave. N.W., Washington, D.C. 20242. Free.
A guide for learning environmental interrelationships with minimal equipment.

Environmental Discovery Units. National Wildlife Federation, 1412 Sixteenth St. N.W., Washington, D.C. 20036. 1972. Complete set of 24 – $31.00. Individual units – $1.50 (14 units) and $1.00 (10 units).
Inquiry-oriented teacher guides with background information, student activities, teaching techniques. Most are for elementary grades and involve easily obtainable materials. Available titles include: *Plants in the Classroom,* Grades 3–6; *Vacant Lot Studies,* Grades 5–9; *Differences in Living Things,* Grades 4–8; *Shadows,* Grades 1–8; *Snow and Ice,* Grades 1–6; *Man's Habitat—The City,* Grades 4–9; *Oaks, Acorns, Climate and Squirrels,* Grades 1–6; *Sampling, Button Populations,* Grades 3–9; *Nature Hunt,* Grades K–1; *The Rise and Fall of a Yeast Community,* Grades 6–9; *Genetic Variation,* Grades 4–9; *Soil,* Grades 2–9; *Tile Patterns and Graphs,* Grades 1–2; *Plant Puzzles,* Grades 1–6; *Brine Shrimp and Their Habitat,* Grades 1–5; *Nature's Part in Art,* Grades

3–6; *Change in a Small Ecosystem*, Grades 5–9; *Outdoor Fun for Students*, Grades 1–12; *Transect Studies*, Grades 3–9; *Stream Profiles*, Grades 4–9; *Contour Mapping*, Grades 4–9; *Color and Change*, Grades K–2.

Environmental Involvement: A Teacher's Guide. Dow Chemical Company, Barstow Building, 2020 Dow Center, Midland, Mich. 48640. 17 pp. One copy per teacher.

Environmental Pollution: Experiences, Experiments, Activities. Elbert C. Weaver. Holt, Rinehart and Winston, 383 Madison Ave., New York, N. Y. 10017. 1971. 61 pp. Jr. high. $1.25 for student handbook, $1.24 for teacher's guide.
A collection of 18 experiments and activities for the study of air and water pollution.

Focus on Pollution. John J. Dommers. American Education Publications, Xerox Co., Education Center, Columbus, Ohio 43216. 1974. 4 booklets, subtitled *Kinds and Causes, A Field Trip, The Ugly Results, Solutions and Controls.* 32 pp each. $.43 each.
Extensively illustrated paperbacks with suggested activities for children K–3. Minimal reading involved.

Forests, (Our Forests) and You. Western Wood Products Association, 1500 Yeon Building, Portland, Oreg. 97204. A packet of booklets ranging from 2 to 30 pages. One packet per teacher.

Garbage, Everything You Always Wanted to Know about. Reynolds Metals Company, 6601 West Broad Street, Richmond, Va. 23261. 20 pp. Up to 5 copies free.

Happiness Is a Well-Managed Forest. Robert Fullerton. Edward Hines Lumber Co., Post Office Box 191, Laramie, Wyo. 82070. 1973. Free.
A 30 page pamphlet with sample lessons for different subject areas. High school.

Investigating Your Environment. Forest Service, U.S. Department of Agriculture, 1801 Assembly St., Columbia, S.C. 29201. 1973. Free.

Land, The Measure of Our. Soil Conservation Service, Information Division, Washington, D.C. 20250.

Mark Steel Fights Pollution. American Iron and Steel Institute, Public Relations Department, 1000 Sixteenth St. N.W., Washington, D.C. 20036. 24 pp. Classroom quantities.

Natural Gas Energy and the Environment. American Gas Association, Educational Services, 1515 Wilson Boulevard, Arlington, Va. 22209.

Observing Our Environment through Our Senses, Unit I. Muscatine-Scott County School System, 1523 S. Fairmount Ave., Davenport, Iowa 52802. Free.
A collection of activities for handicapped children.

Outdoor Activities for Environmental Studies. Clifford E. Knapp. Instructor Curriculum Materials, Instructor Park, Danville, N. Y. 14439. 1971. Grades 4–9. $1.95.
Outdoor activities to help a teacher who is new to the outdoors. Uses inexpensive, student-made materials for math and science studies. Includes objectives, concepts, as well as instructional procedures.

Outdoor Book: Adventure in Environment. National Park Foundation in cooperation with the National Park Service. 54 pp. $.96 per copy for schools. Order from Silver Burdett Company, Morristown, N. J. 07960. Grades 3–6. Ten lessons for 6th grade children.

Outdoor Classrooms on School Sites. Soil Conservation Service, Information Division, Washington, D.C. 20250.

Pep Kit – Pioneer Environmental Program Kit. Telephone Pioneers of America, 195 Broadway, New York, N. Y. 10007. Free.
A kit composed of many project ideas and pamphlets.

Pesticides, Agriculture and the Environment – Some Often Asked Questions. CIBA-GEIGY Corporation, Agricultural Division, Ardsley, N. Y. 10502. 22 pp. Classroom quantities.

Places for Environmental Education. Educational Facilities Laboratory, 477 Madison Ave., New York, N. Y. 10022. Free.
Defines and describes facilities for environmental education.

Pollution: Problems, Projects, and Mathematical Exercises. William C. Kahl. Wisconsin Department of Public Instruction, Division of Instructional Services, Wisconsin Hall, 126 Langdon St., Madison, Wis. 53702. 1972. Grades 6–9. $2.00. Exercises for math.

President's Merit Awards Program. Leslye Arsht, Director. U.S. Environmental Protection Agency, 401 M St. S.W., Washington, D. C. 20460. 1974. K–12. Activities and information for starting environmental clubs or for class projects.

Recycling Coin, The Other Side of the. Kimberly-Clark Corporation, Public Relations Department, Neenah, Wis. 54956. 16 pp. Classroom quantities.

Reynolds Recycling Program for All-Aluminum Cans and Other Aluminum Scrap: A Report. Reynolds Metals Company, 6601 West Broad Street, Richmond, Va. 23261. 20 pp. Up to 6 copies free.

Sediment. Soil Conservation Service, Information Division, Washington, D.C. 20250.

Science in City and Suburb. Xerox Education Center, 1250 Fairwood Ave., Columbus, Ohio 43206. $.40.
A student handbook for explaining natural forces in the city.

Scientific Experiments in Environmental Pollution. Elbert C. Weaver, Editor. Manufacturing Chemists Association. 42 pp. $1.24 per copy for either the Student Edition or Teacher's Manual. One copy of Teacher's Manual free with classroom order. Order from Holt, Rinehart and Winston, Inc., 383 Madison Ave., New York, N. Y. 10017.

Soil and Water Conservation, A Classroom and Field Guide for Teaching. Soil Conservation Service, Information Division, Washington, D.C. 20250.

Sound Advice. Sperry Vickers Division of Sperry Rand Corporation, Sperry Vickers, P.O. Box 302, Troy, Mich. 48084. 14 pp. Classroom quantities, $.10 each.

Suggested Activities Using the School and Its Surroundings as a Resource. Group for Environmental Education, 1214 Arch St., Philadelphia, Pa. 19107. $1.00.
A collection of ideas for learning activities using school buildings and grounds.

Teacher's Guide to Recycling. The Aluminum Association, 750 Third Ave., New York, N. Y. 10017. 1973. Grades 1–6. Free.
A filmstrip with pamphlets and cassette tape encouraging student involvement in recycling.

The Strands Walk. Tom Crider. Point Reyes Natural History Association, Point Reyes National Seashore, Point Reyes, Calif. 94956. $.85.
A brief guide for elementary teachers and children to teach basic skills and concepts.

300,000,000. International Labor Office. Public Information Branch, ILO, 178 Queen St., Ottawa, Ontario KIP511. 1974. Free.
A comic to emphasize the world population problem.

Trees for a More Livable Environment. Chevron Chemical Company, Public Relations, 200 Bush Street, San Francisco, Calif. 94120. 20 pp. Classroom quantities.

You and Your Environment. Walter Scott Houston. Xerox Education Center. 1250 Fairwood Ave., Columbus, Ohio 43206. 1972. Grades 6–9. $.75.

A two-part study including activities, case studies, and puzzles and cartoons.

Water Pollution, A Primer on. Mobil Oil Corporation, Department ST, 150 East 42 St., New York, N.Y. 10017.

Periodicals

Audubon. National Audubon Society, 950 Third Ave., New York, N. Y. 10022. 6 issues. $13.00.

Aware. Community Performance Publications, Inc., Suite 12, 2038 Pennsylvania Ave., Madison, Wis. 53704. $9.00 per year.

Conservation News. National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036. Twice monthly. Free.

Conservation Report. National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036. Weekly during Congressional Sessions. Free.

Environment. Scientists' Institute for Public Information, 438 North Skinker Boulevard, St. Louis, Mo. 63130. 10 issues. $10.00. For subscription write: P.O. Box 755, Bridgeton, Mo. 63044.

Environmental Education Report. Environmental Educators Inc., 1621 Connecticut Ave. N.W., Washington, D.C. 20009. Monthly. $25.00.

Environmental Science and Technology. American Chemical Society, 1155 Sixteenth St. N.W., Washington, D.C. 20036.

Interchange. Population Reference Bureau Inc. Twice Monthly. Grades 7–12. $2.00 per year. Information and suggested activities for teachers.

Journal of Environmental Education. Dembar Educational Research Services. Box 1148, Madison, Wis. 53701. Published quarterly. $7.50 per year.

Journal of Outdoor Education. Lorado Taft Field Campus, Northern Illinois University, Box 299, Oregon, Ill. 61061. Published quarterly. $2.00 per year.

Kansas School Naturalist. Department of Biology, Kansas State Teachers College, Emporia, Kans. 66801. Free.

Kids for Ecology. Zoles, Ltd., Box p-7126, Philadelphia, Pa. 19117. $3.00 per year. A periodical "by kids, for kids."

National Parks and Conservation Magazine: The Environmental Journal. National Parks and Conservation Association, 1701 Eighteenth St. N.W., Washington, D.C. 20009. Monthly. $12.00.

National Wildlife. National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20009. Bi-monthly. $6.50.

Natural History. American Museum of Natural History, Central Park West at 70th St., New York, N. Y. 10024. 10 issues. $8.00 per year.

Nature Conservancy News. 1800 N. Kent St., Arlington, Va. 22209. Published quarterly. $5.00.

South Carolina Out-of-Doors. South Carolina Wildlife Federation, 6941 B North Trenholm Rd., Columbia, S.C. 29206. Published monthly.

South Carolina Wildlife. Department of Wildlife and Marine Resources, Box 167, Columbia, S.C. 29202. Published bi-monthly. $5.00.

Sierra Club Bulletin. Sierra Club, 1050 Mills Tower, San Francisco, Calif. 94104. Monthly. $5.00 per year.

The Conservation Foundation Letter. Conservation Foundation, 1717 Massachusetts Ave. N.W., Washington, D.C. 20036. Monthly. $10.00 per year.

The Conservationist. Department of Environmental Conservation, 50 Wolf Road, Albany, N.Y. 12201. For subscription write to: P.O. Box 2325, Grand Central Station, New York, N.Y. 10017.

The Ecologist. Ecosystems, Ltd., 11 Mansfield St., Portland Place, London, England. Monthly. $4.00 per year.

The following periodicals are designed especially for use by teachers:

Environmental Education News. Michigan Department of Natural Resources Information and Education Division, Lansing, Mich. 48926. Bi-monthly. Free.

National Geographic School Bulletin. National Geographic Society, 17th and M St. N.W., Washington, D.C. 20036. 30 issues. $3.25 per year.

Nature Study. American Nature Study Society, Rt. 1, Homer, N.Y. 13077. Published quarterly. $5.00.

Science and Children. NSTA, 1201 16th St. N.W., Washington, D.C. 20036. 8 issues. $8.00 per year.

Teachers' Environmental Enrichment Materials. T.W. Denison and Company, 5100 West 82nd St., Minneapolis, Minn. 55432. 9 issues. $12.00 per year.

The following periodicals are designed especially for children:

Eco-News. The Environmental Action Coalition, 235 East 49th St., New York, N.Y. 10017. 10 issues. $2.00 per year.

Ranger Rick's Nature Magazine. National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036. 8 issues. $6.00 per year.

The Curious Naturalist. Massachusetts Audubon Society, Lincoln, Mass. 01773. Published monthly. $3.50 per year.

The Living Wilderness. The Wilderness Society, 1901 Pennsylvania Ave. N.W., Washington, D.C. 20006. $5.00 for students and schools.

Resource Materials

A Basic Source List of EE Materials. William Caton, William Mayo, and Roger Schoob. American Society for Ecological Education, c/o Governors State University, Park Forest South, Ill. 60466. 1975. $5.00.

Acclimatizing: A Personal and Reflective Approach to a Natural Relationship. Steve Van Matre. American Camping Association, Bradford Woods, Martinsville, Ind. 46151. 1974. $3.75.
A follow up to *Acclimatization* with additional ideas.

Acclimatization: A Sensory and Conceptual Approach to Ecological Involvement. Steve Van Matre. American Camping Association, Bradford Woods, Martinsville, Ind. 46151. 1972. 138 pp. $3.25.
Unique ideas for sensory and conceptually oriented learning experiences. Emphasizes immersion in the environment and provides procedure for developing "concept loops."

An Ecology Series. Channing L. Bete Co., Inc., 45 Federal Street, Greenfield, Mass. 01301. 1970. $.25 per copy.
Series includes: *Man and His Endangered World, It's a Dirty Old World; Let's Make America Beautiful Again!; Needed: Clean Air; Needed: Clean Water; Let's Dump the Dump.* Scriptographic materials.

Creative Outdoor Play Areas. Peggy L. Miller. Prentice Hall, Inc., Englewood Cliffs, N.J. 07632. 1972. 121 pp.

Earth Manual, The. Malcolm Margolin. Houghton Mifflin Co., 2 Park St., Boston, Mass. 02107. 1975. 184 pp. $5.95.
A handbook of procedures for working with nature—caring for, restoring, and protecting the environment.

Ecology Science Series. Globe Book Company, Inc., 175 Fifth Avenue, New York, N.Y. 10010. Grades 4–6.

	Fewer than 10, subtract 10% of list.	Prices for 10 or more copies of a text.
It's Our Island	$3.00	$2.25
It's Our World	3.96	2.97
It's Our Future	3.96	2.97
It's Our Choice	3.96	2.97
Teacher's Guide . . . Gratis		

Concepts listed for development. Emphasis on vocabulary. Some activities included.

Ecology Series. Pendulum Press, West Haven, Conn. 06516. 1972. High school. *Ecology Primer* – $1.25. The following titles are priced at $.95: *Water Pollution, Air Pollution, Overpopulation, Pesticides, Chemical Invasion, Land and Trash,* and *Noise.*
The *Ecology Primer* is general. The others are all problem oriented.

Environmental Awareness through the Arts. Myrtle Kerr. Louisiana State Department of Education, Baton Rouge, La. 70804. 1973. $4.70.
Many ideas for activities in arts and crafts, sound, communications, and word motivation.

Environmental Conservation Education. Joan Carvajal and Martha E. Munger. Conservation Education Association, The Interstate Printers and Publishers, Inc., Danville, Ill. 60832. 1974. 70 pp. $2.50.
A selected annotated bibliography.

Environmental Education and Your School Site. Donn Paul Werling. Open Lands Project, 53 W. Jackson Blvd., Chicago, Ill. 60604. 1973. 92 pp. $3.00.
A practical handbook to help in the use and development of school sites. Includes analyzing steps in developing play areas, construction, and examples of uses.

Environmental Education – Packet I and II. Marily DeWall. NSTA, 1201 16th St. N.W., Washington, D.C. 20036. 1972–73. K–8. $2.00 as supply lasts.
Packets of resource materials and teachers' guides for elementary grades.

Environmentalist, The. Leonard H. Mooy and Donald L. Stillman. The Environmentalist, 390 Princeton Ave., Santa Barbara, Calif. 93111. 1973. 39 pp. $2.75.
A guide to free and inexpensive materials of environmental interest.

Field Study Manual for Outdoor Learning. Margaret Milliken, Austin F. Hamer, and Earnest C. McDonald. Burgess Publishing Co., 426 S. 6th St., Minneapolis, Minn. 1968. 122 pp. Junior high school level. $2.95.
Information and possible projects in soil, water, animal, and weather studies.

Fundamentals of Ecology. Eugene P. Odum. W. B. Saunders Co., Philadelphia, Pa. 1971. 574 pp. $11.75.
A college text or high school reference on basic principles of ecology.

Learning about the Built Environment. Educational Facilities Laboratories and the National Association of Elementary School Principals. Educational Facilities Laboratories, Inc., 850 Third Ave., New York, N.Y. 10022. 1974.

Man and Environment. Robert H. McCabe and R. F. Mines. Prentice-Hall, Inc., 680 Forrest Road N.E., Atlanta, Ga. 30312. 1972. $4.76.
Junior college or senior high school interdisciplinary guide including environmental concepts and student objectives.

Mini-Explorations of Our Environment. The Handicapped Children's Nature Study Center, Muscatine-Scott County School System, 1523 S. Fairmount, Davenport, Iowa 52802.
Varied units for teachers of the handicapped.

Nature Study for Conservation. John W. Brainerd. Macmillan Co., 866 Third Ave., New York, N.Y. 10022. 1971. 352 pp. $.95 for teachers.
A three part book discussing (1) ecological concepts; (2) inexpensive and unsophisticated methods of observing, analyzing, and recording data relative to environmental components; and (3) responsibility and use of school site.

No Deposit – No Return. Huey D. Johnson. Addison–Wesley Publishing Co., Inc., 9 Dunwoody Park, Suite 120, Atlanta, Ga. 30341. 1970. $2.00.
An anthology made up of 65 papers presented at the conference "Man and His Environment—A View Toward Survival," with suggestions for individual and group action for high school.

Opportunities in Environmental Careers. Odom Fanning. Vocational Guidance Manuals, 620 South Fifth Street, Louisville, Ky. 40202. 148 pp. Paperback – $3.95.
A revision of the 1971 issue contains employment possibilities. For each job the work is described; educational requirements are presented; the employment outlook is reviewed. There is a summary including earnings and working conditions.

Outdoor Education Equipment. Russell Bachert, Jr. and E. L. Snooks. The Interstate Printers and Publishers, Inc., Danville, Ill. 61832. 1974. $7.95.
Useful for any grade level. Plans for easy-to-make items grouped under the headings of animal life, math, weather, soil, and miscellaneous.

Sand County Almanac. Aldo Leopold. Ballantine Books, 36 West 20th Street, New York, N.Y. 10003. Grades 7–12. $.95.
Environmental philosophy and literature for English classes.

The Consumer's Catalog of Economy and Ecology. Jeanne Bendick, Robert Bendick, and Karen Watson. McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, N.Y. 10020. Grades 7–12. $7.95 for hardback. $4.95 for paperback.
Designed to inform consumers how to get the most for their money in an ecologically sound way. Good for anyone who is a consumer.

The Directory of Free and Inexpensive Environmental Education Publications. Jerry L. Underfer. The University of Toledo, Toledo, Ohio. 1974. 44 pp. $2.00.

The Environment Film Review. Environment Information Center, Inc., Film Reference Department, 124 E. 39th Street, New York, N.Y. 10016. $20.00.
Updated annually. Includes 21 catalogs as well as various indexes.

The Environmental Science Program. Laidlaw Brothers, 680 Forrest Road N.E., Atlanta, Ga. 30312. $1.59 per book.
The series includes: *Ecology, Environment, and the Biosphere; The Changing Environment; How People Change the Environment; How Environmental Protection Affects People.* Science text supplements for elementary grades.

The World of – Amphibians and Reptiles, Birds, Fishes, Flowering Plants, Insects, Prehistoric Life, Rocks and Minerals, Stars and Planets, the Earth, the Human Body, Trees, Weather and Climate. Young Readers Press. 1969 and 1971. Elementary. $.60 each.
Dictionary form for quick, easy reference. All fundamentals and essential facts for a basic grasp of subject.

Voices of Earth—Man's Environment. F. C. Kutsenbow, F. C. Randall, and J. J. Jones. Leswing Communications, Inc., 75 Adrian Way, San Rafael, Calif. 94903. 1971. Grades 4–6. $3.95.
A student-teacher resource text for class discussion.

Web of Life Series. George McCue. Benziger, Inc., 866 Third Avenue, New York, N.Y. 10022. 1971. Grades 4–7. $1.60–student booklet. $.40–teachers guide.

A series of student study booklets to increase ecological understanding. Ten booklets: *The Deserts, The Suburbs, The Forests, The Grasslands, The Mountains, The City, The Farm, The Freshwaters, The Oceans, Ecology.* Grades 7–12. *Circle of the World: Reading in Ecology.*

What Makes Education Environmental? Edited by Noel McInnis and Don Albrecht. Data Courier, Inc., 620 South Fifth Street, Louisville, Ky. 40202. 1975. 470 pp., $9.95.

A reference, including reports on various programs as well as information useful to persons involved in planning and developing environmental education programs. A compilation of 44 contributions.

What's Ecology? L. McCombs and N. Ross. Addison-Wesley Publishing Co., Inc., 9 Dunwoody Park, Suite 120, Atlanta, Ga. 30341. 1973. $1.50 for paperback. $.96 for teachers guide.

This paperback presents a study of the science of ecology suitable for one semester of high school work. Discussion of basic ecological concepts.

Multi-Media

A Look at Our Environment: A Mixed Media Unit. Educational Ventures, 209 Court St., Middletown, Conn. 06457. Grades 6–8. *Sacrifice Game* – $4.95; *Land Use Game* – $1.95; *Mike's World–Your World* – $.75.

Game and reading materials.

Environmental Action: Recycling Resources. Continental Can Co., The Creative Teacher, Inc., P.O. Box 5187 Grand Central Station, New York, N.Y. 10017. 1971. Grades 5–9. $25.00.

Teacher guide, student text, two filmstrips, and simulation game to include awareness of solid waste problems.

Environmental Awareness. Robert Joslin and Larry West. Centron Educational Films, 1621 West 9th St., Lawrence, Kans. 66044. 1971. Grades K–12. $69.50.

An aesthetic approach to environmental awareness consisting of five filmstrips with cassettes and a teacher's guide. Topics include: *Colors in Nature, Patterns in Nature, Textures in Nature, Awareness in Forest and Field,* and *Awareness in the City.*

Geography in an Urban Age. Association of American Geographers. Collier–Macmillan School and Library Services, 866 Third Ave., New York, N.Y. 10022. High school.

A six unit course with teacher handbooks involving students in activities concerned with man-land relationships.

Unit 1: *Geography of Cities* – $252.00 (complete set)
Unit 2: *Manufacturing and Agriculture* – $55.50
Unit 3: *Cultural Geography* – $15.00
Unit 4: *Political Processes* – $42.00
Unit 5: *Habitat and Resources* – $42.00
Unit 6: *Japan* – $8.40

Investigating Air, Land, and Water Pollution. Diane Storin. Pawnee Publishing Company, Inc., One Ponderfield Road, Bronxville, N.Y. 1971. Grades 7–12. $1.50. Complete package with kits – $40.00.

Investigations in Life Science: Man and Nature. BSCS. Crystal Productions, Inc., P.O. Box 11480, Aspen, Colo. 81611. 1975. High school level. Four units–$147.00.

Daylight blackboard projections that encourage students to do something with the information provided.

Modular Activities Program in Science (M.A.P.S.). Houghton Mifflin Company, 666 Miami Circle N.E., Atlanta, Ga. 30324. 1974.

Twenty-three science modules with consumable student books or hardback. Kits are available. Good for quinmester. Grades 1–6. $.90–$1.00 per text. Kit – $45.00. Environmental Modules include: *Population Needs, Ecological Interactions, Adaptations, Interaction in a Population.*

They use simple inexpensive equipment and provide optional activities for individualization.

Natural Resource Concept Pack. Unit I: Using Natural Resources. Unit II: Conserving Natural Resources. Milton Bradley Co., Springfield, Mass. 01101. Grades 4–8. $7.50 per pack.

Game and posters with information for the teacher.

Our Environment Series. EMC Corporation, 180 East Sixth St., St. Paul, Minn. 55101. Intermediate grades. The series includes:

Aesthetics	36.00
Sound and Noise	34.00
Fresh Water Communities	78.00
Salt Water Communities	64.00
Atmosphere	85.00

This series covers all phases of the environment in a comprehensive multi-media format. Color filmstrips with record or cassette sound tracks, transparencies, graphs and charts, student activities on black line and spirit duplicator masters, and teachers' guides—all together they tell the story of the environment we share.

Resource Recovery and You. National Association of Secondary School Principals. 1904 Association Drive, Reston, Va. 22091. 1974. Grades 10–12. $12.00 per kit.

Includes chart, general guide, and special guides for Social Studies, Industrial Arts, and Science. Project sections included.

Survival Kit: Ecology and Social Action. C. Richard Hatch. Harper and Row Publishing Company, School Department, 2500 Crawford Ave., Evanston, Ill. 60201. 1972. Grades 7–12 in social studies and ecology. $50.00.

A quarter course or unit in social studies which includes posters, readers, filmstrips, records, student guides, and teacher's manual.

SELECTED REFERENCES

SELECTED REFERENCES

1. Bennett, Dean B. *The Environmental Education Resource Center.* Maine Environmental Education Project. Title III, E.S.E.A. Yarmouth, Maine, 1972.

2. Bennett, Dean B. *Environmental Education Program: Organization and Operation.* Maine Environmental Education Project. Title III, E.S.E.A. Yarmouth, Maine, 1972.

3. Bennett, Dean B. *Environmental Education Resource Guide.* Maine Environmental Education Project. Title III, E.S.E.A. Yarmouth, Maine, 1973.

4. Bennett, Dean B. *Guidelines for Evaluating Student Outcomes in Environment Education.* Maine Environmental Education Project. Title III. Yarmouth, Maine, 1972.

5. Bennett, Dean B. and Richard H. MacGowan. *The Environmental Education Committee.* Maine Environmental Education Project. Title III. Yarmouth, Maine, 1972.

6. Boulanger, David F. and John P. Smith. *Educational Principles and Techniques for Interpreters.* Pacific Northwest Forest and Range Experiment Station. Forest Service. Portland, Oregon, 1973.

7. Center for the Development of Environmental Curriculum. *Environmental Learning Resources.* Wiloughly Eastlake City Schools. Wiloughly, Ohio, 1973.

8. Chester Area Schools, South Dakota Interlakes Environmental and Outdoor Education Program. *Administrator's Environmental Education Evaluation Manual.* South Dakota University. Vermillion, South Dakota.

9. Conservation Education Association. *Environment Conservation Education; A Selected Annotated Bibliography.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1974.

10. Conservation Education Association. *Evaluating.* Danville, Illinois: The Interstate Printers and Publishers, Inc., 1966.

11. Cox, Dorothy A. and William B. Stapp. *Environmental Education Activities Manual.* 30808 La Mar, Farmington Hills, Michigan, 1974.

12. Dayton Museum of Natural History. *Do-It-Yourself Environmental Handbook.* Boston, Massachusetts: Little Brown and Co., 1972.

13. Department of Health, Education and Welfare, Office of Education. *Environmental Education Handbook.* (PL 91–516), 1973.

14. Divisions of Elementary, Secondary and Vocational Education. *Environmental Education.* Richmond, Virginia, 1974.

15. Engleson, David C. *Materials for Environmental Education.* Madison, Wisconsin: Wisconsin Department of Public Instruction.

16. Environmental Education Planning Council of New Hampshire, The. *Environmental Education for New Hampshire: A Plan for Community Involvement Environmental Education Planning Council of New Hampshire.* Concord, New Hampshire.

17. Essex, Martin W. *Environmental Education: Why, What and How.* Columbus, Ohio: State of Ohio Department of Education, 1973.

18. Florida Department of Education. *Florida Master Plan Environmental Education.* Tallahassee, Florida, 1972.

19. Governor's Task Force. *Michigan's Environmental Future; A Master Plan for Environmental Education.* State of Michigan, 1973.

20. Grenda, Ted W., Chairman, Environmental Task Force. *Environmental Education Instructional Activities.* Albany, New York: The University of the State of New York, The State Education Department, 1970.

21. Hawkins, D. E. and D. A. Vinton. *The Environmental Classroom.* Englewood Cliffs, New Jersey: Prentice-Hall, 1973.

22. Hill, Larry. *Planning Guidelines for Environmental Education.* Alaska Department of Education, 1972.

23. Huskey, Renee. *Directions of Environmental Education in Georgia.* Atlanta, Georgia: Georgia Department of Education, 1974.

24. Indiana Environmental Education Advisory Committee. *Total Environment Education.* Indiana State Department of Education, 1973.

25. Institute for Environmental Education. *An Environmental Education Guide for Administrators.* Series B. Cleveland, Ohio: Institute for Environmental Education.

26. Jameson, Barry W. *Living Within Our Means: Energy and Scarcity.* Albany, New York: The University of the State of New York, The State Education Department, 1973.

27. Kelsey, Frances W. "Field Aides Help to Take School Outdoors." *Science and Children,* Vol. 12, Number 3, November/December 1974.

28. Michigan Department of Education. *Environmental Education Guidelines.* Lansing, Michigan, 1973.

29. Minnesota Department of Natural Resources Bureau of Information and Education. *Learning to Live.* State of Minnesota.

30. New Jersey State Council for Environmental Education. *Evaluation for Environmental Education: A Systems Analysis Approach for Self-Evaluation.* Mountain Lake, New Jersey, 1969.

31. Nyquist, Ewald B. *Environmental Education Strategies.* Albany, New York: New York Department of Education, 1972.

32. Ohio Department of Education. *Resident Outdoor Education.* Columbus, Ohio, 1973.

33. Pennsylvania Environmental Education Advisory Council. *Report.* State of Pennsylvania, 1974.

34. Schlich, Victor A. "Environmental Encounters." *American Education.* August-September 1971.

35. Simons, Robert et al. *Focus on Environmental Education.* The Curriculum Developmental Council for Southern New Jersey. Glassboro, New Jersey: Glassboro State College, 1970.

36. Tanner, R. Thomas. *Ecology, Environment, and Education.* Lincoln, Nebraska: Professional Educators Publications, Inc., 1974.

37. Thompson, Francis J., Director, ECOS Training Institute. *Environmental Education—Community—Opportunity for Stewardship.* ECOS, Yorktown Heights, New York, 1974.

38. U.S. Department of Agriculture, Soil Conservation Service. *Developing Your Own Environmental Classroom.* Dover, Delaware, 1973.

39. U.S. Department of Agriculture. *Conservation Tools for Educators; Putting Conservation to Work.* Forest Service, Pacific Northwest Region, 1968.

40. Van Matre, Steve. *Acclimatizing: A Personal and Reflective Approach to a Natural Relationship.* Martinsville, Indiana: American Camping Association, Bradford Woods, 1973.

41. Van Matre, Steve. *Acclimatization: A Sensory and Conceptual Approach to Ecological Involvement.* Martinsville, Indiana: American Camping Association, Bradford Woods, 1972.

42. Wert, Jonathan M. *Developing Environmental Education Curriculum Materials.* Park Forest South, Illinois: American Society for Ecological Education, c/o Governors State University, 1974.

43. Wert, Jonathan M. *Developing Environmental Study Areas.* Park Forest South, Illinois: American Society for Ecological Education, c/o Governors State University, 1974.

44. Wert, Jonathan M. *Environmental Education Study Projects for High School Students.* Park Forest South, Illinois: American Society for Ecological Education, c/o Governors State University, 1974.

45. Wert, Jonathan M. *Writing Environmental Education Grant Proposals.* Park Forest South, Illinois: American Society for Ecological Education, c/o Governors State University, 1974.

APPENDIXES

APPENDIX A

STATE AGENCIES WITH ENVIRONMENTAL INVOLVEMENT

South Carolina Department of Agriculture
P.O. Box 11280
Room 527, Wade Hampton Building
Columbia, S.C. 29201

South Carolina Department of Archives and History
P.O. Box 11669
Columbia, S.C. 29201

South Carolina Department of Education
Rutledge Building
Columbia, S.C. 29201

State Energy Management Office
Rutledge Building
Columbia, S.C. 29201

South Carolina Forestry Commission
P.O. Box 21707
5500 Broad River Road
Columbia, S.C. 29221

South Carolina Department of Health
and Environmental Control
J. Marion Sims Building
2600 Bull Street
Columbia, S.C. 29201

South Carolina Highway Department
P.O. Box 191
Columbia, S.C. 29202

South Carolina Land Resources
Conservation Commission
P.O. Box 11708
1400 Lady Street
Columbia, S.C. 29211

South Carolina Museum Commission
1023 Woodrow Street
Columbia, S.C. 29205

South Carolina Department of Parks,
Recreation and Tourism
P.O. Box 113
E.A. Brown Building
1205 Pendleton Street
Columbia, S.C. 29202

Patriot's Point Development Authority
P.O. Box 624
186 Concord Street
Charleston, S.C. 29402

South Carolina Water Resources Commission
P.O. Box 4515
3830 Forest Drive
Columbia, S.C. 29204

South Carolina Wildlife and Marine
Resources Department
P.O. Box 167
Dutch Plaza, Building D
Columbia, S.C. 29202

FEDERAL AGENCIES WITH STATE OFFICES

Department of Agriculture

Soil Conservation Service
240 Stoneridge Dr.
Columbia, S.C. 29210

S.C. National Forests
1801 Assembly St.
Columbia, S.C. 29201

Department of Commerce

National Oceanic and Atmospheric Administration
Columbia Metropolitan Airport
Columbia, S.C.

Department of Interior

Fish and Wildlife Services
1801 Assembly St.
Columbia, S.C. 29201

APPENDIX B

SOUTH CAROLINA REGIONAL PLANNING OFFICES

SOUTH CAROLINA APPALACHIAN COUNCIL OF GOVERNMENT
The Century Plaza
Building D
211 Century Drive
P.O. Box 6668
Greenville, S.C. 29606
Telephone: (803) 242–9733

COUNTIES SERVED:
Anderson, Cherokee, Greenville, Oconee, Pickens, Spartanburg

UPPER SAVANNAH REGIONAL PLANNING AND DEVELOPMENT COUNCIL
P.O. Box 1244
Greenwood, S.C. 29646
Telephone: (803) 229–6627

COUNTIES SERVED:
Abbeville, Edgefield, Greenwood, Laurens, McCormick, Saluda

CATAWBA REGIONAL PLANNING COUNCIL
107 Hampton Street
P.O. Box 862
Rock Hill, S.C. 29730
Telephone: (803) 328–6108

COUNTIES SERVED:
Chester, Lancaster, Union, York

CENTRAL MIDLANDS REGIONAL PLANNING COUNCIL
Suite 155, Dutch Plaza
800 Dutch Square Boulevard
Columbia, S.C. 29210
Telephone: (803) 798–1243

COUNTIES SERVED:
Fairfield, Lexington, Newberry, Richland

LOWER SAVANNAH REGIONAL PLANNING AND DEVELOPMENT COUNCIL
P.O. Box 850
Aiken, S.C. 29801
Telephone: (803) 648–8341

COUNTIES SERVED:
Aiken, Allendale, Calhoun, Bamberg, Orangeburg, Barnwell

SANTEE–WATEREE REGIONAL PLANNING COUNCIL
P.O. Box 1837
Sumter, S.C. 29150
Telephone: (803) 775–7381

COUNTIES SERVED:
Clarendon, Kershaw, Lee, Sumter

PEE DEE REGIONAL PLANNING AND DEVELOPMENT COMMISSION
P.O. Box 4366
Florence, S.C. 29501
Telephone: (803) 669–3138

COUNTIES SERVED:
Chesterfield, Darlington, Dillon, Florence, Marlboro, Marion

WACCAMAW REGIONAL PLANNING AND DEVELOPMENT COUNCIL
1001 Front Street
P.O. Box 419
Georgetown, S.C. 29440
Telephone: (803) 546–8502

COUNTIES SERVED:
Williamsburg, Georgetown, Horry

BERKELEY–CHARLESTON–DORCHESTER REGIONAL PLANNING COMMISSION
2 Courthouse Square
Room 302
Charleston, S.C. 29401
Telephone: (803) 577–7800 ?

COUNTIES SERVED:
Berkeley, Charleston, Dorchester

LOWCOUNTRY REGIONAL PLANNING COUNCIL
P.O. Box 98
Yemassee, S.C. 29945
Telephone: (803) 589–2751

COUNTIES SERVED:
Beaufort, Colleton, Hampton, Jasper

APPENDIX C

SAMPLE MODULE FOR HIGH SCHOOLS FROM
MAN AND ENVIRONMENT FOR SECONDARY SCHOOLS
(developed by the National Association for Environmental Education)
THE ENERGY CRISIS AND THE DEPLETION OF NATURAL RESOURCES

Overview

Increased world population in conjunction with increased per capita demand has raised the consumption levels of energy and natural resources to an alarming level. Research and applied technology have not yet discovered solutions to this environmental crisis.

It is essential that man understand the basic principles and interactions of matter and energy and examine closely the use and abuse of energy and natural resources in the past and present.

This module is designed to make the student aware of this environmental crisis and to provide a framework within which he might plan future use and management of natural resources. Such planning will include economic, political, and sociological factors.

Concepts

A. Energy is found in several forms. The form of energy can change but efficiency is lost in the process.

B. Within an ecosystem the recycling of matter and flow of energy are interrelated.

C. Due to increased growth and consumption patterns, there is an increasing demand for resources that are limited.

D. Increased resource demands have an increasingly profound impact upon the environment of the world.

E. Resource use and development affects and is affected by economic, political, and technological systems.

F. Solutions to this environmental crisis will require new technology, a change in life styles, and both short- and long-range planning.

Student Objectives

A. The student will:

   1. understand that the supply of energy is not constant

   2. study the biological factors (sun, plants, food chains, webs, pyramids) and the physical factors (water, air wind) in energy flow

B. The student will:

   1. trace matter cycles both biological (carbon, nitrogen, oxygen, water) and physical (rock cycles)

   2. understand the interaction between material cycles and energy flow

C. The student will:

   1. gain a historical perspective of the crisis by studying early man and agricultural, industrial, and technological uses of resources

2. understand the current situation by making an inventory of resources and by studying sources, depletion rates, limits, and distribution of natural resources

3. will plan projections for the future by examining exponential usage, new sources, trade offs, recycling, and anticipated requirements

D. The student will:

1. examine the following factors which have influenced natural resources in the past: destruction of forests in Europe, dust bowls and ocean dumping in the United States, wildlife extinction

2. examine the following factors which are currently influencing supplies of natural resources: land scars, loss of open space, oil slicks, radiation, thermals, blackouts, disposal problems

3. examine the following factors which will influence projections for the future: ramifications of total depletion, pollution increase, globalization of impact, increased impact on natural and man-made systems

E. The student will:

1. study economic factors in the use of natural resources (e.g., markets, transportation)

2. examine local, regional, and international political factors which contribute to the crisis

3. study the uses of technology in developed and underdeveloped nations (support systems, production of electricity and steel)

F. The student will:

1. examine technological advances which will contribute to a solution to the crisis (new energy sources, alternative synthetic resources, recycling)

2. show ways in which changes in life styles, attitudes, values, beliefs, and behavior will solve this crisis

3. show the necessity of establishing priorities and planning trade offs and realize that new solutions may create new problems

APPENDIX D

SAMPLE FORM FOR COMPILING INVENTORY OF COMMUNITY RESOURCE PEOPLE

1) Name: ____________________

Home Address: ____________________

____

Occupation: ____________________

2) Name of organization, group, school, business, etc., with which you are affiliated: ____________________

____

Address: ____________________

Telephone: ____________________

3) Area of your special environmental interest or concern: ____________________

____

____

4) Personal knowledge, skills, expertise: ____________________

____

____

5) In what ways can you share your knowledge, skills, expertise to help project ECOS staff in community/school action programs? Some examples might be: resourse person for student/teacher groups; workshop leader; provide special materials and information; take groups on trips or tours; demonstrations (of equipment, techniques, etc.); trainer for teachers, students, community people; writer; artist; consultant (fee?); etc.

____

____

____

____

____

____

____

____

____

____

APPENDIX E

A PRELIMINARY CHECKLIST OF COMMUNITY RESOURCES

(reference 35, pages 20–21)

The community offers great potential for environmental understandings. Most communities have common resources. The following list contains a few of the community resources which might be utilized as potential teaching stations for environmental understandings.

1. Agriculture

____ farms
____ ranches
____ fields
____ irrigation ditches
____ farm machinery
____ livestock
____ truck gardens
____ barns
____ insecticide control
____ pastures
____ crops
____ fences
____ cisterns
____ wells

2. Manufacturing

____ industrial complexes
____ factory buildings
____ waterfronts
____ waste piles
____ power plants
____ warehouses
____ railroad yards
____ docks
____ deposits of finished products
____ settling ponds
____ piles of raw materials
____ generating stations

3. Recreation

____ hunting and fishing grounds
____ water impoundments
____ boat yards
____ sporting equipment supply
____ golf courses
____ fishing piers
____ fish hatchery
____ game farm

4. Transportation and Communication

____ railroad tracks
____ terminals
____ repair shops
____ tunnels
____ bridges
____ roads
____ culverts
____ parking areas
____ shopping centers
____ waterways, rivers, lakes, canals
____ coastal and oceanic waterways
____ harbors
____ docks
____ locks
____ bus storage buildings
____ telegraph lines
____ radio and TV broadcasting stations
____ underground conduits
____ railway stations
____ airports
____ airplane hangars
____ air terminal
____ paved runways
____ grass runways
____ pipelines
____ electric power transmission lines
____ pipelines for gas or oil
____ electric power sub-stations
____ telephone poles and lines
____ radio and TV towers

5. Water Supply

- ____ water treatment plant
- ____ water pipe mains
- ____ pumping stations
- ____ fire hydrants
- ____ water storage tanks
- ____ managed water sheds
- ____ water reservoirs
- ____ rivers

6. Other Resources

- ____ weather station
- ____ sewage disposal plants
- ____ junk yards
- ____ garbage dumps
- ____ firehouse
- ____ police station
- ____ city park
- ____ vacant lots
- ____ county parks
- ____ state parks
- ____ mining operations
- ____ nature centers
- ____ graveyards
- ____ arboretum

APPENDIX F

SCHOOL YARD CHECKLIST

(reference 35, pages 18–20)

Filling out the attached checklist should give you a better idea of the potential your property has for environmental activities.

ESTIMATE IN PERCENT THE USE OF THE TOTAL SITE:

____[illegible] Building, parking, roads, sidewalks
____[illegible] Formal lawns and landscaped areas
____3. Play areas—athletic fields, tennis courts, swings, blacktop
____4. Athletic areas—football fields, etc.
____5. Undeveloped or unused area with outdoor education potential
____6. Other (be specific)

SCHOOL BUILDING

____Wood frame
____Stucco
____Brick
____Other

SOILS

SOIL CONDITION

	Poor:	Average:	Good:
____Clay	____	____	____
____Silt	____	____	____
____Sand	____	____	____
____Gravel	____	____	____

TREES (Put percentage each.)

____Shade trees
  ____Native
  ____Planted
  ____Deciduous
  ____Coniferous
____Plantations
  ____Species
____School forest
  ____Species
____Density
  ____Open
  ____Medium
  ____Closed

GRASS AREAS

____Lawn (soil stabilization, flowers, landscaping)
____Playfields (soil stabilization)
____Wild grass

SHRUBS

____Foundation plantings
____Hedges (windbreaks, dust or noise filters, erosion checks, etc.)
____Bushes

FORB AREA (Forbs are non-woody, herbaceous plants, e.g., goldenrod, bull thistles, etc.)

____Annual plants
____Perennial plants

BARREN AREAS

____Paved areas
____Eroded areas
____Graveled areas

WATER AREAS

____ Stream
____ Pond
____ Puddles
____ Ditches
____ Storm sewers and gutters

ELEVATIONS

____ Hill slope
    ____ Gradual
    ____ Steep
____ Hilltops
____ Gully sides from erosion

WILDLIFE

____ Species and abundance
____ Homes (in trees, under roots, holes in the ground, on tree branches, in drain pipes, etc.)
____ Droppings (on stumps, sidewalks, grass, side of building, etc.)
____ Tracks (in mud, dust, etc.)

WETLAND AREAS

____ Swamps (forested or in shrubs and bushes)
____ Bog
____ Marsh (cattails, grasses, reeds, etc.)
____ Flood areas (sedimentation, debris, etc.)

ROCKS AND MINERAL AREAS

____ Stone walls
____ Sidewalks
____ Driveways and parking lots (graveled)
____ Curb stones
____ Eroded areas (exposed rocks)

OUTLYING AREAS (near the school grounds)

____ Open fields
____ Croplands
____ Orchards
____ Deserted farms
____ Old graveyards
____ Old building foundations
____ Tree stumps
____ Fence rows
____ Nursery (trees, shrubs, etc.)
____ Local park
____ State or National park
____ Vacant lots
____ Excavations

ATTRACTIONS

Topography ______________________________

Geology ______________________________

Wildlife ______________________________

Vegetation ______________________________

Water features ______________________________

History and archaeology ______________________________

Beach ______________________________

Other ______________________________

____

What is your opinion as to the potential for developing this site into a usable area for outdoor environmental studies? (A perimeter development on even small sites is always a possibility.)

High potential _____ Some potential _____ Very low potential _____

Possibly a perimeter type area could be established (sketch map attached) ______________

EXISTING DEVELOPMENTS OR FACILITIES (describe) ______________________________

____

____

____

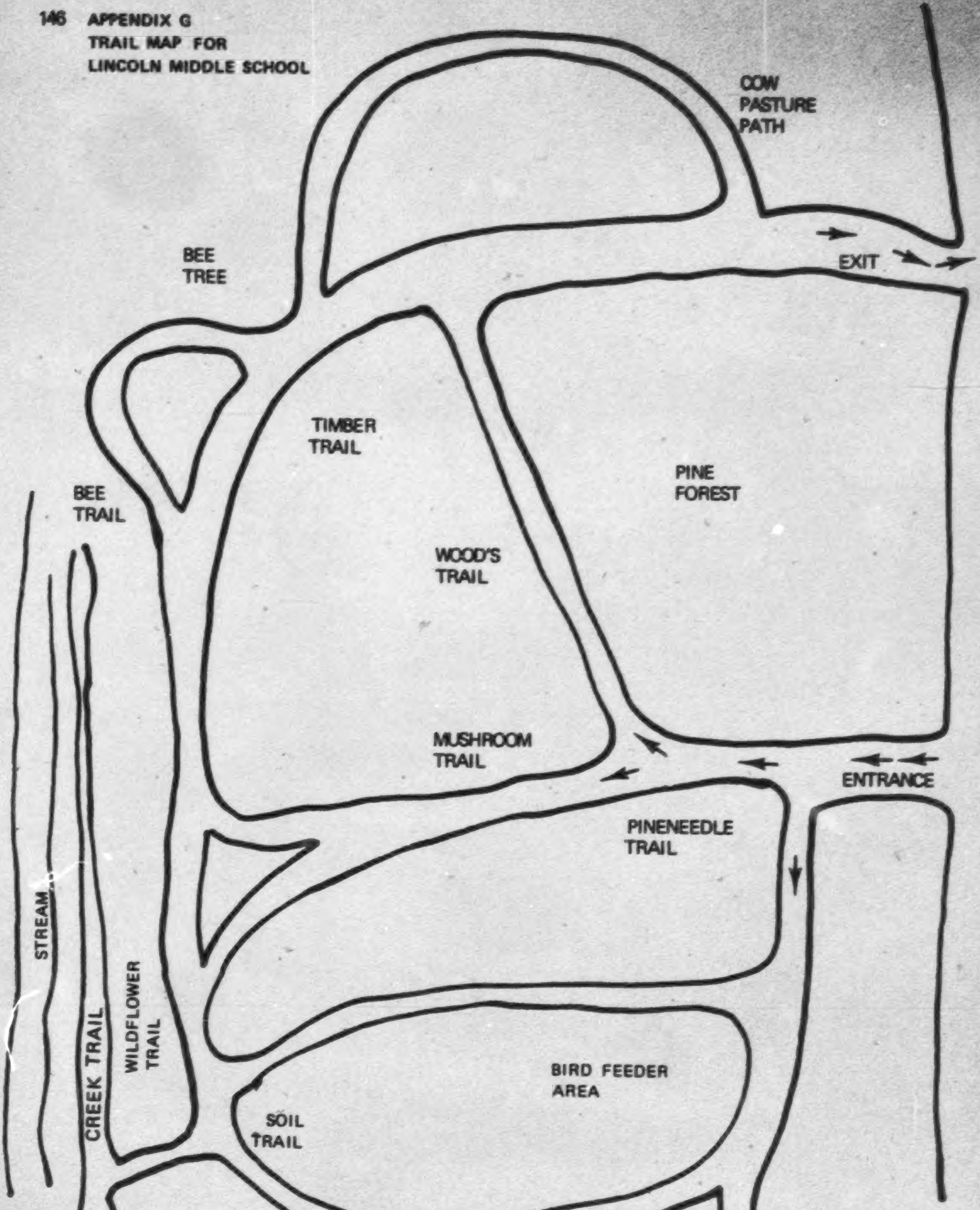
EXISTING USE (type and degree) ______________________________

____

____

____

APPENDIX G
TRAIL MAP FOR LINCOLN MIDDLE SCHOOL


COW PASTURE PATH
BEE TREE
EXIT
TIMBER TRAIL
PINE FOREST
BEE TRAIL
WOOD'S TRAIL
MUSHROOM TRAIL
ENTRANCE
PINENEEDLE TRAIL
STREAM
CREEK TRAIL
WILDFLOWER TRAIL
BIRD FEEDER AREA
SOIL TRAIL

APPENDIX H

PRELIMINARY CHECKLIST OF OUTDOOR LAB RESOURCES

Title of Outdoor Lab (if applicable) ____________________
Name of school or center ____________________
Address ____________________
Person to contact ____________________
Date of survey __________ Initials __________

Developed by:
Bill Childers
Graduate Student
Clemson University

I. EXISTING RECREATIONAL AREAS:

Golf courses ________
Playground ________
Baseball field ________

Tot lot ________
Football field ________
Track field ________

Basketball courts ________
Tennis courts ________
Other ________

II. PROGRAM ORGANIZATION:

Facility will be used and planned for the following:

Students ________
Adults ________
Family groups ________
Resident use ________

Agency ________
Church ________
Handicapped ________
Multi-usage ________

City ________
School only ________
Other ________

III. SEASONAL USAGE OF FACILITY:

	Number of uses		Number of uses
Summer ____	____	Weekend ____	____
Spring ____	____	Vacation ____	____
Fall ____	____	Year-round ____	____
Winter ____	____	Other ____	____

IV. WHICH TEACHERS USE THE LAB?

Science ________
Math ________
English ________

Social studies ________
Other ________

V. CAPACITY:

How many acres in lab? ________ Number of acres in school property? ________
Is there additional land available? Yes ____ No ____

Rent ______
Lease ______

Buy ______
Free ______

If so, how much? ________

VI. PROBLEMS OF ADJACENT SITES:

Dumps ________
Picnic areas ________
Hunting grounds ________
Erosion problems ________

Roads and highways ________
Commercial land ________
Other ________

VII. TERRAIN:

Level land ____________
Woods ____________
Streams ____________
Lakes and ponds ____________
Rocks ____________
Terraced land ____________
Grassland ____________
Swamp ____________
Marshland ____________

VIII. LAND DEVELOPMENT:

Roads in area:
Trails in area:
Fences on land:

IX. EXISTING BUILDINGS:

School ____________
Gym ____________
Nature center ____________
Interpretive areas ____________

X. IS THERE AN ENVIRONMENTAL EDUCATION COMMITTEE?

Faculty ____________
Student ____________
Faculty & student ________
PTO ____________
Public ____________
Mixed ____________
Other ____________

XI. OPPORTUNITIES BEING USED:

Diversity of flora ____________
Drainage patterns ____________
Erosion ____________
Soil types ____________
Others ____________
Diversity of fauna ____________
Air pollution ____________
Solid waste disposal ____________
Weather station ____________
Water study ____________
Ecological study areas ____________
Amphitheater ____________
Trails ____________

XII. OTHER AREAS OF USE IN AREA:

City parks ____________
State parks ____________
County recreation ________
Weather station ________
Vacant lots ____________
Mining operations ________
Nature centers ________
Graveyards ____________
Arboretum ____________
Junk yards ____________

XIII. WHO DESIGNED EXISTING AREA?

Local people ____________
State agency ____________

XIV. HAVE YOU HAD ANY GOVERNMENTAL ASSISTANCE?

Yes ____________
No ____________
If so, whom? ____________

XV. DRAW A ROUGH MAP OF SCHOOL AREA.

APPENDIX I

SAMPLE INFUSION UNIT

Content Outline
(For Present or Proposed Instruction)

Animals and Plants

Grade Level 4 — **Subject–Science–Social Studies**

Habitat

a) What are some habitats of living things?
b) What is the kind of habitat in which you live?
c) What lives in the habitat of a pond?
d) What animals and plants live in the sea?
e) What plants and animals live on mountains?
f) How do plants and animals live in other regions?
g) How do some animals survive seasonal changes?
h) How do other living things change habitat?
i) How are living things protected from their enemies?
j) How are plants and animals prepared for the future?
k) Are some kinds of plants and animals no longer on earth?

Diversity

a) How do animals move?
b) How do animals get food?
c) How do animals digest their food?
d) How do animals get air?
e) How are animals protected?
f) How do animals begin life?
g) How do plants move?
h) How do plants nourish themselves?
i) How are plants protected?
j) How do plants begin life?

Community

a) How do plants depend on other plants?
b) How do plants depend on animals?
c) How do animals depend on plants?
d) How do animals depend on other animals?
e) How do animals cooperate with each other?
f) How do animals compete with each other?
g) What is man's place in the web of life?
h) How do animals and plants depend on man?

Classification

a) What is a "mammal"?
b) What is a "bird"?
c) What is a "reptile"?
d) What is an "amphibian"?
e) What are the characteristics of a "dicot"?
f) What are the characteristics of a "monocot"?

Infusion Possibilities (Based on Environmental Categories)	Activities
Air Pollution a) What is good (clean) air? Do we have good air now? How can we tell? b) Can the air be improved? How? c) How does air pollution affect plant growth? d) How can man protect plants from air pollution? e) Are animals affected by air pollution? In what way? f) What is the relationship between man and the effects of air pollution on plants and animals?	**Air Pollution** a) Hold a white saucer above a lighted candle. Have students imagine that the candle is the gasoline being burned in a car engine; on the saucer they can observe soot or burned carbon. This soot is like the exhaust that comes from a car that fills our air and our lungs. b) Have the children place plants in various parts of the community; observe the effects of air pollution on the growth of the plants. The children should then be able to construct a chart of the areas with the least and most amount of pollution.
Food and Drugs a) Green plants are the ultimate source of food, clothing, and shelter. b) What has happened to the food supply? c) How does food supply affect animals? d) What can man do to improve food supply?	**Food and Drugs** a) Grow bean plants in the light and in a darkened area to illustrate photosynthesis and point out that the sun is the ultimate source of energy. b) Students will make and do the following: 1) Dye clothing 2) Hand dip candles 3) Make butter 4) Weave and quilt
Land Use and Misuse a) How does man use land? b) How does man misuse land? c) How does misuse of land affect animals and plants? d) How can misused land be improved? e) What can be done to prevent the misuse of land?	**Land Use and Misuse** a) Children will identify good and poor environments, take pictures, display them, and give reports on what they found. b) Children will identify areas which would be good habitats for animals and make recommendations on how to improve them. c) Make a map of the school area on the wall, floor, or on a table top. Include major land forms, roads, buildings, parks, etc.
Water Pollution a) What is good (clean) water? b) Is the water good now? c) How can we tell that water is good? d) How can we tell when water is polluted? e) Can polluted water be cleaned and used? How? f) What effect does polluted water have on plants? g) How are animals affected by polluted water? h) Is man the only one who pollutes water? i) How can water pollution be prevented? j) What effect does pollution have on the total water supply? k) How can man increase the water supply?	**Water Pollution** a) Children will use the Methylene Blue B.O.D. method to test the water in and around the community. They will then display their results and make reports on their findings. b) Alternate 3" squares and 1" squares of marine masonite until there are four of each. Join these with a screw through the center. Have the children place these in various water sources (e.g., ponds, lakes, and streams). After several days have them take them out and sort and count the different kinds of "crawlies." Point out that the more variety there is the less the water is polluted. Make a chart of the findings.
Wildlife a) What is the relation between animals and people (the nutrient cycle)? b) What are some of the animals that lived in this area in the past? c) What animals live in this area today? d) What part did man play in this change of animals? e) How can man improve his relationship with animals?	**Wildlife** a) Children will observe the wildlife of the community and keep a list of the kinds and number. They will then research these animals and report to the class on what they found on each. b) Children will implement their suggestions for improving the habitat of the animals in the community. (e.g., make bird feeders, clean up the areas where these animals live, plant various types of cover, etc.)

Resource Needs		Administrative Support
(Material)	(People)	
Air Pollution Saucer Candle Plants Chart paper Magic markers	Dr. Priester (Health and Environmental Control) Millipore Corp.	**Air Pollution** Need District permission to place plants in the community.
Food and Drugs Bean plants Dyes Wax or paraffin Churn and various ingredients to make butter Loom and yarn Needle and thread	Dr. Edge (USC) Joyce Evans (SAVE) Jack Birch (construction) Speaker from EPA	
Land Use and Misuse Camera Cardboard Knife Potato Opaque projector	Official from the Highway Dept. Conservation Dept. official to help with habitat	**Land Use and Misuse** Need permission from the principal to go out and take pictures
Water Pollution Methylene blue Marine masonite Screws Chart paper Magic markers Water sampling kit	Person from the Forestry Dept. to help with plants	**Water Pollution** Need District permission to go to water sources and make tests
Wildlife Birdseed Wood Hammers Nails Plants Shovels		**Wildlife** Need administration approval to leave to put out feeders, etc. *Note:* Need parental permission to do all of the above things

APPENDIX J

WRITING ENVIRONMENTAL EDUCATION GRANT PROPOSALS

Prepared by
Dr. Jonathan M. Wert

This brochure has been written to assist you in preparing a proposal for environmental education funding. It is *not* to be used in place of a particular funding agency's guidelines—only to give you a basic understanding of what the proposal reviewer generally expects or looks for. REMEMBER—ALWAYS READ AND FOLLOW THE PROPOSAL GUIDELINES. They will differ according to the agency, foundation, etc., to which you are making application. The following presents the topics which are generally addressed in a well-written proposal.

Title Sheet

Give the title of the program (or project); name, complete address, and telephone number of the applicant; and the date.

Required Funding Agency Forms

These documents will vary according to agency, foundation, etc.

Table of Contents

Include the topics covered and page numbers where they are described.

Abstract

Give a condensed overview of the program, what it will do, and the target group(s) it is designed to reach. The importance of the abstract cannot be emphasized enough. It must be clear and lucid, and will help the reviewer immensely. Include it even if the agency's guidelines do not call for it.

Rationale

Include information on the need and justification for the program. In most cases (for example, under the Environmental Education Act of 1970), your program should be community problem focused, interdisciplinary, and action oriented. Address both environmental and educational problems—how they have been or will be identified locally. Give a brief description of existing environmental education efforts in the geographic area to be served by your program. Discuss the target group(s) you are seeking to reach (program receivers). Again, be aware of those target groups in which the funding agency is most interested. Do not send a good proposal to an agency having limited interest in it.

Short- and/or Long-Range Goals

List the general ends to which the program is directed. An example of a general goal for environmental education would be: To develop an environmentally literate citizenry in the Tennessee Valley region.

Objectives

List the specific ends which the program is designed to attain or achieve. These should be quantifiable. An example of a specific objective for environmental education would be: To develop an environmental education curriculum for grades kindergarten through twelve.

Approach

This is a very important part of a proposal. Lack of clarity, redundancy, or too brief an exposition will really be detrimental. Describe the activities and/or strategies (process) which will be used in accomplishing or achieving the objectives. Address such topics as:

1. What *specifically* will be done; for example, curriculum development, workshops, teacher training, resource materials development, etc?

2. When will it be done? Give a time line or schedule showing when the work will be done. This could also be given in the appendix. (See item 5 under appendices below.)

3. How will the work be done? Briefly address the planning, implementation, operation, and evaluation process. In evaluation, describe how you will measure outcomes or outputs, i.e., behavior change as a result of your efforts. Briefly address how evaluation data (feedback) will be used in decision making and improving and modifying future efforts. Include any alternative approaches you are going to consider in performing the work and achieving the objectives.

4. Who is going to do the work? Briefly address your existing and/or cooperative working relationships (linkages) with other entities concerned with environmental education program development; for example, community groups, educational institutions, resource agencies, etc. It is important to demonstrate, perhaps with letters of support or cooperation, that people concerned can reasonably be expected to help. (See item 1 under appendices below.)

Appendices

In this section, you should include whatever documentation you feel would help clarify or support anything in your proposal. Basically, you should include:

1. Letters of endorsement from those entities involved or concerned.

2. Qualifications of the applicant—include a brief vitae of the program director (and any other personnel directly involved), brief history of the entity submitting the proposal, listing of past environmental education accomplishments, etc.

3. A map of the geographic area to be served by the program, if necessary for clarification.

4. A detailed reasonable budget breakdown. (This is often required in addition to the cost figures put in the REQUIRED FUNDING AGENCY FORMS which were mentioned above.) The breakdown should correspond to the description given in the narrative.

5. Flowcharts or models showing linkages with other agencies, conceptual planning process, and a time line.

The points discussed in the following section are criteria (with minor modification) which the U.S. Office of Environmental Education (HEW) utilizes in evaluating grant proposals for funding. Keep them in mind when you are preparing your proposal.

YOUR PROPOSAL MUST BE WELL DESIGNED.

MAKE SURE IT:

contains specific objectives in terms of intended outcomes or expectations for the participants;

provides sufficient detail on the methodology (activities and strategies) for achievement of the objectives and that these are appropriate for achievement of the stated objectives;

clearly indicates that it has been designed in response to a well-conceived needs assessment;

will utilize appropriate multidisciplinary or interdisciplinary content and approaches;

defines potentially effective means by which the participants will be involved in the development of the project and its conduct and the materials developed as part of the project;

provides for field testing of any materials to be developed;

can be implemented within the context of the project design and contains evidence that the applicant understands the difficulties and is prepared to deal with them;

suggests effective use of resources and delivery systems;

contains a well-defined self-evaluation plan;

is not too ambitious and does not deal with too many areas and that it concentrates on enough, but not too many, activities in order that a good job be done in those areas, given the limits of time, money, and staff involved.

THE PROGRAM MUST USE INNOVATIVE TECHNIQUES AND MATERIALS. MAKE SURE THAT:

the product of the program promises to be effective and probably does not now exist;

the approaches promise to contribute new insights into effective environmental education practices.

THE ENVIRONMENTAL EDUCATION CONTENT OF YOUR PROPOSAL MUST BE SOUND. MAKE SURE IT:

reflects an understanding of the philosophy and content of environmental education and the means of furthering its purposes.

THE PROPOSAL MUST PROVIDE FOR USE OF VOLUNTEERS WHEN THEY ARE AVAILABLE AND WOULD ENHANCE THE PROGRAM. MAKE SURE IT:

identifies those groups who will do work, those whom you have worked with in the past and plan to work or coordinate your future efforts with.

THE PROBLEMS TO BE ADDRESSED IN YOUR PROPOSAL MUST BE SIGNIFICANT EDUCATIONALLY AND ENVIRONMENTALLY. MAKE SURE IT:

addresses problems and resources relevant to the lives of the participants;

encourages exploration of community environmental problems and use of community resources;

adresses long-range environmental problems as well as immediate environmental concerns.

THE POTENTIAL MULTIPLIER EFFECT OF YOUR PROGRAM MUST BE SIGNIFICANT. MAKE SURE THAT:

appropriate community involvement is evident and is composed of elements which have been known to have a positive influence on public knowledge or opinion;

there is an indication as to how the activities proposed can be expected to continue or generate other locally supported efforts after the termination of this grant;

there is adequate evidence regarding proposed multipliers or replication of the efforts to be supported under this project.

YOUR PROGRAM SHOULD PROMISE TO BE NATIONALLY AS WELL AS LOCALLY SIGNIFICANT. MAKE SURE IT:

would significantly advance the state of the art of environmental education, in terms of content development and utilization at the national as well as the local level;

will produce product(s) which show promise of being significant additions to the resources of environmental education;

clearly shows the national significance of this program.

YOUR BUDGET MUST BE REASONABLE AND APPROPRIATE. MAKE SURE IT:

is reasonable and appropriate for the proposed activity.